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Secretary of the Interior

DOUGLAS McKAY

FOR THE FISCAL YEAR ENDED JUNE 30

1953
ANNUAL
REPORT

Secretary of the Interior

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FOR THE FISCAL YEAR ENDED JUNE 30

UNITED STATES DEPARTMENT OF THE INTERIOR

Douglas McKay, Secretary

March 3, 1849

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D. C.

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March 3, 1849

THE SECRETARY OF THE INTERIOR
WASHINGTON

My Dear Mr. President: I transmit herewith the annual report of the Department of the Interior for the fiscal year which ended June 30, 1953.

The report indicates the measure of continued progress which is being made in assuring the wise use and sound development of all of our natural resources. It also highlights some of the problems which the Nation faces with regard to its natural resources. Some of these problems are now in the process of solution. Others will demand continued attention. In all cases, the Department is working earnestly to assure that its resource responsibilities are carried out effectively.

Sincerely yours,

Douglas McKay
Secretary of the Interior.

The President,
The White House,
Washington, D. C.

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PART I

SOUND MANAGEMENT OF THE NATION'S NATURAL RESOURCES

SOUND MANAGEMENT OF THE NATION'S NATURAL RESOURCES

When the new administration took office on January 20, 1953, it assumed as one of its vital functions the responsibility for providing leadership in the conservation and development of the Nation's natural resources. This responsibility, largely vested in the Department of the Interior, was accepted with a keen realization of the importance of assuring that the natural resources of the United States are developed as efficiently and used as wisely as possible.

The crucial significance of American's natural resources in providing a firm foundation for the growth of our industry, the expansion of our employment, and the constant improvement of our American way of life is readily evident. However, it is not enough that our resources be maintained to meet the day-to-day needs of the American people. In addition, we must be sure that they are adequate to meet any emergency challenge in the future.

A JOINT RESPONSIBILITY

The importance and magnitude of our resource responsibility demands the full cooperation of all of the American people. The sound conservation and development of our natural resources is not a task for the Department of the Interior alone. Nor is it a task for only State and local agencies, or for free enterprise alone. Rather, it is a task in which we can succeed only through a program of close teamwork in which Federal agencies, State and local agencies, and free enterprise work together, each performing the function for which it is best fitted.

Maximum State and local sponsorship and participation in resource programs will be a continuing objective of the Department. Similarly, we shall encourage free enterprise to undertake the type of new projects which it can carry out effectively.

The Department of the Interior, however, has been given certain responsibilities by Congress to provide leadership in this common task. It will carry out these responsibilities, and those that may be assigned to it in the future, in accord with the expressed will of Congress. The paramount purpose shall be to guarantee that our tasks will be performed in a manner which will assure the most efficient and wisest utilization of our natural resources.

Sound Management

In achieving this objective, the magnitude and variety of the problems assigned to the Department by Congress makes efficient and sound business management essential.

The Department administers 275 million acres of public land in the United States and 300 million acres in the Territory of Alaska.

It markets electric power produced by plants having an installed generator capacity of approximately 6,600,000 kilowatts. This represents 7.76 percent of the total installed capacity of generating plants in utility service in the United States as of June 30, 1953.

It has constructed facilities which in 1952 were capable of providing a full supplemental water service to approximately 7 million irrigable acres.

It is responsible for the welfare of about 400,000 Indians.

It increases the national minerals potential by developing and improving mining and beneficiation techniques, and by promoting better health and safety conditions in our mineral industries.

It administers 180 national parks and monuments, 6 Territories, certain island possessions, and 96 trust territory island units.

It promotes the conservation and development of vital fish and wildlife resources.

It conducts extensive geological surveys of mineral and water resources of the United States, and carries on a far reaching program of topographic mapping.

To carry out these and other assigned functions, too numerous to summarize briefly, the Department of the Interior employs about 50,000 persons and spends about $425 million, annually. Clearly, in an enterprise of this size and importance, the difference between efficient management and wasteful and unsound administration can be of vital importance to every taxpayer.

Establishing the Pattern

In the period of less than 6 months between January 20 and June 1953, the Department moved forward rapidly in adopting policies in keeping with the twofold objective of: (1) Maximum cooperation among Federal, State, and local interests in developing the Nation's resources; and (2) management techniques to assure maximum economy and efficiency in carrying out legitimate Federal functions.

By the end of the fiscal year, the pattern of policy and organizational management was already to a large degree established, although many details necessarily remained to be spelled out in subsequent decisions and announcements. In the following sections this pattern will be briefly summarized in connection with the prime responsibilities of the Department.

Department Reorganization

A study of the organization of the Department which was promptly launched when the new administration took office showed that through the years the Department had grown up as an aggregation of separate bureaus, each tending to go its own way, and to resist coordination from the Secretary's office.

The devices established for coordination at the departmental level were found to be cumbersome and far from fully effective. There were no less than five staff divisions in the Secretary's office responsible for coordinating planning and operations. Although these divisions were supposed to act only as staff facilities to the members of the secretariat, without any independent responsibilities, they in fact exercised considerable authority on their own. Furthermore, there was wasteful duplication of effort among these divisions, which was reflected also in inadequate coordination of the activities of the various bureaus.

Coordination of departmental programs at field level through the departmental field committees was similarly not fully effective.

As a move toward correction of these deficiencies and in order to administer the Department more efficiently and to effect economies, the following primary steps were taken:

(1) The Program Staff and the Divisions of International Activities, Minerals and Fuels, Land Utilization, and Water and Power were discontinued, and the responsibility for advance planning, and for coordination among bureaus was placed in the line of operations—that is, in the bureaus and the Assistant Secretaries' offices. Each Assistant Secretary continued direction and supervision over a specific group of bureaus and offices, as in the past, in the Minerals Resources, Public Land Management, and Water and Power Development fields, respectively. Overall coordination of the Department's activities was reserved to the Secretary and Under Secretary.

(2) A Technical Review Staff was established in the Office of the Secretary which is available to assist the Secretary as requested, and to provide independent review of problems referred to it by the Secretary, Under Secretary, Assistant Secretaries or bureau chiefs. This staff exercises no independent responsibility or authority, but its facilities are available to the secretariat to aid in obtaining overall coordination as required.

(3) The field committees of the Department were reconstituted by secretarial appointment of a responsible regional official of a bureau in each region as chairman to replace the former full-time chairman and staff. Needed staff facilities were provided largely from the bureaus, supplemented by some assistance from the Secretary's office. In the Missouri Basin, special circumstances related to the Department's program for the basin, dictated continuance of the full-time field committee chairman, although with a reduced staff.

(4) All liaison with other Departments and with Congress pertaining to legislation other than appropriation bills has been coordinated through the new Office of Legislative Counsel responsible directly to the Secretary. This office maintains regular contact with appropriate congressional committees and necessary intermittent contact with other departments and committees, and is kept fully advised of all legislation and departmental contacts made by the bureaus. By supervising the preparation of the Department's legislative program and its presentation, this office assures coordination within the Department and avoids duplicating of bureau activity.

(5) All publicity and public relations have been coordinated through an office operating under the Secretary. Formerly each bureau operated independently.

(6) All legal activities have been coordinated under the Solicitor in order to establish a direct line of authority and responsibility for all legal actions in the Department. The new procedure provides that while routine legal matters may be passed on finally by the chief field attorney, determination of novel or nonroutine legal questions must be submitted to the Solicitor for review and approval.

These organization changes have placed more direct responsibility on operating bureaus and the Assistant Secretaries for coordination of planning and operations. They have clearly established coordination responsibilities for legal activities, legislative liaison and public relations, and have eliminated much duplication of effort. Significant savings in the Department's administrative costs are expected to result.

Significant improvements have already been made in coordination of the Department's activities with those of other Federal agencies, and studies are proceeding on effecting further improvements. A program of frequent meetings of members of the Secretariat with their counterparts in the Departments of Agriculture and the Army was instituted, to consider mutual problems in the field of natural resources, and to agree upon a single course of action. A critical evaluation of existing interagency machinery in the field of water resources was started with a view toward improving coordination of work among the agencies.

In addition, a detailed review of the organization and operating procedures of each bureau and agency of the Department has been started with a view to developing the most effective and efficient means of accomplishing the Department's programs. These reviews are being conducted by highly qualified teams carefully selected for their knowledge of efficient administrative procedures and of specific problems in the areas involved. The teams include top-level management personnel from industry and expert professional consultants as well as selected personnel from within the Government but outside of the bureau being surveyed. Upon the completion of these surveys, the necessary bureau reorganizations are being undertaken with the objective of realizing savings in the Department's budget while at the same time providing better service to the American people.

These surveys involve intensive studies of organizational structure; operating policies, standards, and procedures; programs and commitments; delegation and redelegations of authority; relations with other bureaus of the Department, other Federal agencies, and State and local governments; and public relations. In general, the surveys are designed to accomplish greater streamlining, coordination, and efficiency and are not intended to develop policies affecting the type or scope of activities conducted by the various bureaus.

An overall management improvement program has also been instituted to supplement on a continuing basis the surveys being conducted by the Secretary's Office. Under this program a review system has been established in each of the bureaus to provide a means through which the opportunities and the need for improvement in each bureau can be systematically identified and a definite program of action developed to effect these improvements as scheduled. In this program advantage will be taken of the audits of the Civil Service Commission, the General Accounting Office, and other outside agencies.

REAPPRAISING OUR RESOURCE PROGRAMS

The United States has been blessed with stands of great forests, millions of acres of fertile land, abundant water and fuel resources, and a generous supply of most essential minerals. Throughout our history, the richness of these natural resources has contributed greatly to our growth and prosperity as a Nation, and to an increasingly full life for our people.

The very abundance of our resources, however, has sometimes led us to unwise and wasteful exploitation of nature's gifts. In earlier periods, we have cut our forests recklessly without regard to the needs of tomorrow. We have permitted vast numbers of our fertile acres to erode and wash away. We have plundered our precious hoard of essential minerals by using wasteful extractive and recovery methods. We have failed to make maximum recovery and use of our resources of coal and natural gas.

Fortunately, we have recognized many of our errors. The great conservation movement started at the turn of the century by Theodore Roosevelt and Gifford Pinchot pointed the way. Over the years we have corrected many of the early mistakes. We have increasingly adopted sustained yield policies in managing our forests. We have learned to conserve our irreplacable topsoil by better methods of farming. We have improved our extractive and recovery procedures for both minerals and fuels, thus reducing our lost and wasted supplies.

We are improving rapidly, but with the consumption of all of our resources growing by leaps and bounds, and destined to increase even more rapidly in the years ahead, we dare not relax our efforts.

However great, our resources are not unlimited. As long as our resource ledger shows an annual deficit our balance for future withdrawals is inevitably reduced. We must continue to improve the conservation of our natural resources by every method available.

While all Americans are united in favoring the wise use and conservation of our great natural resources, too much emphasis has been placed in recent years upon Federal responsibility in this field, as though only the Federal Government were competent and had the necessary financial ability to do what is right and required. Too little attention has been given to the role that the States and local governments and free enterprise are willing and able to play.

The Department has therefore begun a reappraisal of its resource and development programs. The first steps translating this point of view into policy and legislative recommendations have been taken. Legislation was introduced and passed in the 1st session of the 83d Congress confirming and establishing the rights of States to all lands and resources beneath navigable inland and offshore waters within their historic boundaries and providing for the exercise of Federal responsibility outside these borders.

A new policy with regard to Federal development and marketing of electric power was promulgated. It further reflects the need for cooperative effort in resource development which is being emphasized by the Department.

The President and the Congress have set the wheels in motion for further progress. Through legislation setting up a new Committee on Organization of the Executive Branch of the Government and a Commission on Intergovernmental Relations, the Congress has provided for careful review and advice in the natural resources field, as in other fields of governmental activity, looking toward changes in organization and programs that will make for better operation of the Federal Government and a better balance of responsibility between Federal, State, and local governments, and free enterprise.

The ability of States and local governments and free enterprise to finance their proper natural resources responsibilities independently of the Federal Government is, of course, crucial to the achievement of better balance.

The national interest in the development and conservation of our great resources will no doubt require that a large area of responsibility should continue to be exercised by the Federal Government. Some clear Federal responsibilities, indeed, have not always been emphasized as much as they should have been.

The agencies of the Department of the Interior will have an important part to play in synchronized private and public programs for the development and conservation of our natural resources. The foundation for any sound conservation program, for example, is knowledge of the resources which we have available. Only by a continuing inventory showing the extent and state of our resources can we develop wise programs for use on a sustaining basis. The Geological Survey and the Bureau of Mines with their extensive surveys and analyses of our resources of minerals, fuels, land, and water can provide much of the data which are the starting points for overall resource planning by both private and public agencies.

The field investigations and exploration programs of these agencies also make possible large additions to our available supply of resources by discovering new deposits and new sources of minerals, oil, natural gas, and coal. Resources which are unknown are useless and every new discovery is a real, net gain on our resource balance sheet.

Our Interior agencies are also making substantial contributions to national conservation programs by their research activities which make possible more complete extraction and recovery of mineral and fuel resources, thus again adding to the credit side of our resource balance. These research activities also are being directed with increasing success to the development of technological processes which make possible the substitution of metals in ample supply for those in short supply.

Conservation Does Not Mean Hoarding

While this type of activity clearly contributes to a positive program of conservation, it must be recognized that conservation calls for a full though orderly development of our resources, whether of water, land, minerals, fuel, timber, fish, or wildlife. We cannot continue to grow as a Nation and as a prosperous people if we adopt the narrow view of conservation as requiring the locking up of our resources. Such a program of hoarding our resources is a negative approach which, if long continued, can result in artificial and unnecessary shortages. While we must be alert to provide the reserve supplies which may be critically required in a national emergency, our paramount efforts should be directed to a constant expansion of our resource base rather than merely to hoarding what we have. Orderly resource development should not be halted or unduly delayed by Federal mandate.

A NEW FEDERAL POWER POLICY

One of the more pressing tasks which the new administration in the Department of the Interior faced was the formation of a sound policy to guide the Department's activities in the production and marketing of surplus hydroelectric power. A new approach to this problem was urgently needed in order that the Department could effectively carry out the mandate of Congress and not usurp legislative prerogatives by administrative orders.

By June 30, 1953, considerable progress had been made in the formulation of policies compatible with the new administration's aim to encourage participation of the States, local communities, and private citizens.

A careful analysis was made of the policies laid down by Congress to direct the activities of the Department with respect to hydroelectric power. Congress, beginning with the Reclamation Act of 1906, had established three major statutory mandates to govern the Department's power policies. These mandates based on the concept of Federal power as a byproduct of necessary reclamation, flood control and navigation activities, can be briefly summarized as follows:

(1) To dispose of federally produced electricity in a manner conducive to the welfare of the project and the water users and the liquidation of the project power costs.

(2) To dispose of such energy for the most widespread distribution of benefits to the largest number of domestic and rural users.

(3) To give preference in the sale of energy to municipalities, cooperatives, and public organizations.

Pattern Set By Legislation

The Reclamation Act of 1906 established the pattern which fundamentally is still the law, with this provision: "whenever a development of power is necessary for the irrigation of lands under any project undertaken by the said Reclamation Act or an opportunity is afforded for the development of power under such project, the Secretary of the Interior is authorized to lease for a period not exceeding ten years, giving preference to municipal purposes, any surplus power or power privileges, and the monies derived from such leases shall be covered into the Reclamation Fund and be placed to the credit of the project from which such power is derived, provided that no lease shall be made of such surplus power or power privilege as will impair the efficiency of the irrigation project."

Subsequent legislation by Congress, including the Boulder Canyon Act of 1928, the Reclamation Project Act of 1939, the Bonneville Power Administration Act of 1937, the Fort Peck Act of 1938, and the Flood Control Act of 1944, all served to confirm the intent of Congress that the Department's statutory power policy should be limited to the disposal of hydroelectric power which is generated incident to the construction of irrigation works or of navigation or flood control dams.

In the act of 1935 authorizing the construction of the Grand Coulee Dam, for example, it is stated that the project is being built for "the purpose of controlling floods, improving navigation, regulating the flow of streams of the United States, providing for the storage and for the delivery of the stored waters thereof, for the reclamation of public lands and Indian reservations, and other beneficial uses, and for the generation of electric energy as a means of financially aiding and assisting such undertaking."

The Department of the Interior recognizes that many proposed present-day hydroelectric projects are of such huge scope and tremendous cost that only the Federal Government is in a position to finance them. Many of them are multipurpose projects involving, in addition to hydroelectric power, such diverse features as recreational area development, fish and wildlife conservation, irrigation, improved navigation, flood control, municipal water supply, and water storage. These multipurpose projects are also frequently interstate in character and some of the functions fall primarily in the Federal zone. For these and other reasons, it is clear that in many cases these large multipurpose projects must be constructed by the Federal Government. In engaging in these projects, however, the Federal Government should not assume the primary responsibility for supplying the power needs of an area. This responsibility properly rests with the people locally.

The Department of the Interior does not assume that it has the exclusive right or responsibility for the construction of all the hydroelectric projects in the United States. On the contrary, it will not oppose the construction of these facilities by local interests—public or private—which are willing and able to undertake them under appropriate licenses from the Federal Power Commission. As long as such projects promote the most effective development of the natural resources of a particular region, the Department will follow a policy of encouraging rather than discouraging their construction by local interests.

In addition to specifying that the hydroelectric features of Department of Interior dam projects are incidental to the irrigation features, Congress has also provided that the power produced by such projects should be disposed of in a manner designed to give preference to public organizations and to assure the most widespread distribution to domestic and rural users.

The obligation of the Department of the Interior with respect to power as expressed by Congress may, therefore, be summarized as selling an incidental Government product in a manner designed to help recoup a Government investment, to give preference to public agencies, and cooperatives, and to benefit the largest number of domestic and rural consumers.

In administering the Department's power projects in accord with this threefold congressional mandate, however, a number of problems arise, particularly when conflicts between the three congressional directives develop.

Legislation providing for repayment of the investment for irrigation purposes without interest, and for power and municipal water supply and miscellaneous purposes with interest, and providing that flood control and navigation investments may be largely nonreimbursable, imposes the task of allocation and assignment of the costs of multiple purpose projects.

Due to (1) rising construction costs, (2) changes in the scope and size of project, (3) delays in construction, and (4) inadequacy of cost estimates, rates, based upon project cost estimates, have been promulgated which, in some cases, may not provide sufficient return to meet the statutory requirement for repayment of actual costs.

The Department of the Interior is considering all of these problems carefully with an earnest desire to provide solutions which will be fair and equitable both to the taxpayer and to the users of the water and power distributed from Department projects.

The policies which the Department proposes to follow in planning, constructing, and operating facilities for the production, transmission, and sale of electric energy are in the process of formulation.

However, the broad outlines of these policies have already been indicated. The trend toward Federal monoply must be halted. State, local groups, and private organizations should be encouraged and assisted in providing facilities for supplying electric power, thus leaving to the Federal Government those projects which are too large and complex to be undertaken by smaller groups.

Transmission lines necessary for the proper intergration of Federal generating facilities will be constructed by the Federal Government. It will also build and operate the necessary facilities for carrying power to load centers within economical transmission distance unless other public or private agencies provide such facilities upon reasonable terms. In disposing of electric energy, the Department will give preference to public bodies and cooperatives, and privately owned utilities serving domestic and rural consumers will be given preference over industrial users.

Rates for the sale of power shall be based upon costs providing for recovery of the Federal power investment with interest generally in not more than 50 years. Ordinarily, the Department will not include any resale rate restrictions in its contracts for the sale of power to public agencies and cooperatives. Provisions will be made in contracts with private utilities for passing on to retail consumers the savings in cost resulting from the purchase of federally generated power.

The Department is moving forward in line with the new power policy of the Administration. Of the total Bureau of Reclamation construction program of $174 million for the 1954 fiscal year, for instance, more than one-third, about $63,400,000, will be spent on hydroelectric power development and distribution facilities or on construction of multipurpose dams which will have power production as a major function.

The Department has recommended appropriation of as much money as can be used to continue work at the most economic rate of construction. The present transmission line program is such that, in combination with various wheeling agreements, facilities will be available to transmit all power from Reclamation or Army engineers hydroelectric plants now under construction as soon as they are placed in operation.

DEVELOPING OUR WATER RESOURCES

The development of irrigation water to meet the growing needs of the West is one of the most critically important responsibilities of the Department of the Interior. Providing water to make fertile millions of acres of otherwise semi-arid and unproductive lands as required to meet the needs of our growing economy is clearly a function that is in the national interest. The Department fully supports this vital reclamation program and intends to push forward with new projects as they may be justified and needed.

The Bureau of Reclamation, the Interior Department agency charged with the primary job of developing our national water resources for irrigation purposes, is now supplying water to almost 7 million acres in the 17 Western States. This program has paid, and will continue to pay, rich dividends to all of us.

The lands made productive by water from Bureau of Reclamation projects today are sending to the market crops valued at almost $1 billion or an average crop value of more than $155 per acre. Not only are these reclaimed lands thus aiding in a major way in meeting our growing food requirements, but the added national income and broadened tax base which they make possible are of tremendous indirect benefit to the Nation.

Responsibility of Water Users

Congress has wisely provided that water users themselves should assume the responsibility as quickly as possible for the operation of facilities for irrigation constructed by the Bureau of Reclamation. Out of 267 Federal reclamation projects or divisions of projects, only 28 are operated in entirety by the Bureau of Reclamation and the Department of the Interior is anxious, in keeping with its conviction that such functions can best be performed by local interests, to turn over the few remaining projects to the local water users. It is expected that this can be accomplished in the next year with respect to several important projects.

Water users have contracted to repay nearly $690 million of the cost of Federal reclamation projects and the future of the entire reclamation program may depend to a large degree on the ability of the water users to fulfill these contracts successfully. The Department is, therefore, cooperating fully with water-user organizations in carrying out an active rehabilitation and improvement program to assure the usefulness of existing irrigation facilities over a long-term period.

In furthering the progress of the reclamation program, the Department of the Interior will give full recognition to the role that can be played by State governments and other local public agencies. The financial resources of the several States, added to the resources of local free enterprise, can, with the cooperation of the Federal Government, provide the broad base which will make possible sustained and orderly progress. The need for a continuing reclamation program in the Western States is undeniable and by pushing ahead on a cooperative basis with this program we can keep advancing western growth and prosperity.

The Department believes that the reclamation program, like all others, can be well served by increasing efficiency in the operation of the responsible Government agencies. Already, large strides have been taken in this direction. In June 1953, for example, the Bureau of Reclamation experienced the second highest month of construction activity of the 1953 fiscal year at the same time that improved organizational efficiency was making possible annual savings of nearly $7,400,000.

Construction Program Pushed

During the closing months of the fiscal year, a program was developed for fiscal 1954 under which the Bureau of Reclamation is undertaking a construction program totaling more than $174 million. This program has as its goal providing irrigation water for over 248,000 acres of land and the installation of almost 300,000 kilowatts of hydroelectric capacity by June 30, 1954.

Depending on the availability of funds, construction to be carried out in fiscal year 1954 will also enable the Bureau to complete irrigation facilities to serve 385,000 additional acres in fiscal year 1955 and 228,000 acres in fiscal year 1956, plus installation of 241,500 kilowatts of generating capacity in 1955.

Of the land for which irrigation facilities will be completed in fiscal year 1954, 139,714 acres are now irrigated partially but require a supplemental supply. The bulk of this supplemental irrigation will be provided on the Colorado-Big Thompson project which will be ready to serve an additional 122,000 acres early in calendar 1954, bringing the total served by this trans-Continental divide water diversion project to 410,000 acres. The remaining 205,000 acres are scheduled to be served with water by the end of 1955 fiscal year.

The Colorado-Big Thompson project will also complete work on the Pole Hill and Flatiron power plants in fiscal year 1954, adding another 104,750 kilowatts capacity to the hydroelectric system.

The Columbia Basin project in central Washington, which already has facilities for the irrigation of 131,000 acres of new land, will add facilities for another 55,000 acres by the end of fiscal 1954, and has scheduled the completion of facilities for another 61,000 acres of new land in each of the succeeding 2 fiscal years. All publicly owned land or land which is purchased by the Government on this project is offered for resale in family-size units as rapidly as water becomes available. Additional lands for public settlement will also be made available on the North Side pumping unit of the Minidoka project in southern Idaho and on the Gila project on southwestern Arizona, which have programs of $1,068,000 and $4,500,000, respectively, scheduled during the 1955 fiscal year.

This partial summary of the scheduled construction program of the Bureau of Reclamation reflects the Department's vigorous support of the policy of reclaiming the arid and semiarid lands of the West. In carrying out this program the Department believes the water-development projects must be based on long-range and basin-wide plans to assure maximum effectiveness. And, most important of all, the Department will be diligent in insuring that projects are undertaken only if they are supported by the people in the local areas which will be benefited.

Saline Water Program

The Department is pressing forward with the new saline water conversion program, authorized by Congress in June 1952, to develop practicable methods of converting saline water to fresh water. This program is important both in inland areas and on the coasts. In inland areas, constant re-use of water from irrigation projects has in some cases increased the salinity of the water to a degree that development of an economical means of de-salting has become important. In coastal areas, of course, the long-range objective is the development of means of converting sea water into fresh water to assure more adequate water supplies for heavily populated areas which face growing water problems.

The research authorized under this program is being carried out, as provided by law, primarily by private institutions. Definite progress, including the promise of a reduction in the cost of de-salting an irrigation supply, has been made. This pioneer work may play a part in revolutionizing many concepts of water use and development.

A National Water Policy

Because of the importance of a coordinated, soundly conceived program of water development, the Department believes that the formulation of a national water policy is in the public interest. Since the turn of the century, a number of national laws dealing with water resources have been passed by Congress. Various agencies of the executive branch of the Government, each with responsibilities in the water resource area, have adopted varying policies in carrying out their assigned functions. As this process has continued at an ever more rapid pace, confusion, duplication, and lack of coordination has inevitably resulted. Today there are three principal departments of the Federal Government operating in the water resources field, each under different laws. The Department of Defense through the Corps of

Engineers is primarily interested in flood control and navigation; the Department of Agriculture has important responsibilities in soil conservation; and the Department of the Interior is the agency responsible for reclamation. Because of basic conflicts among the laws of Congress as well as in the policies of the three agencies, waste, and in some cases, retarded development of our water resources has resulted.

It appears clearly desirable, therefore, that a positive overall program be developed to replace the existing patchwork of conflicting laws and policies. The Department of the Interior is working with other affected agencies of the Federal Government to achieve the early development of a national water resources policy which will afford a firm foundation for real progress in conservation and development of our water resources.

MINERAL RESOURCES

Minerals are one of the indispensable foundations of our dynamic industrial economy. The critical demands of modern technology and mass production have created vastly increased requirements for many essential, well-known minerals, as well as developed new and vital uses for some metals which only a few years ago were virtually unknown outside of experimental laboratories. Our dependence upon minerals of all kinds is so great, indeed, that the Department of the Interior's activities in aiding in minerals' exploration and research must be deemed one of its most crucial responsibilities.

While we have exhausted some of our easily discoverable mineral deposits, and our imports of some minerals are steadily increasing, this country has by no means reached a critical point of diminishing returns with respect to its domestic mineral resources. Modern geological research methods are pointing the way to new sources, hitherto unsuspected, and improved technology is making it possible to utilize some mineral reserves previously considered unsuitable for profitable development. This merely serves, however, to underline the importance of the program of exploration and research being conducted by the two principal technical mineral bureaus of the Government, the Bureau of Mines and the Geological Survey.

Development of New Techniques

New areas of potential ore bodies are constantly being found as the result of new techniques conceived and perfected by the Geological Survey. The Survey has found, for example, that valuable clues to new deposits exist in the form of trace elements found in soils, waters, and surficial deposits, and new and improved geophysical instruments are being developed to aid in the search for mineral wealth. Through its basic studies in applied physics and chemistry, the Survey is adding almost daily to our store of scientific knowledge essential to continued progress in minerals' investigations.

Bureau of Mines engineers and metallurgists are devoting their energies to testing and improving mining techniques and developing new methods of ore concentration and beneficiation. From a low-grade deposit, the Bureau has produced material acceptable for making ferromanganese and research is being conducted in the recovery of cobalt, nickel, tungsten and other critical and strategic metals from domestic sources. Amazing progress is being made in extracting metals which occur in abundance but which previously have been unused commercially. Within this category is the Bureau's work on zirconium at Albany, Oreg.; on titanium at Boulder City, Nev., and on rare and precious metals at Reno, Nev. The limited supply of high-grade sheet mica has imparted urgency to the development of substitutes or synthetics and the Bureau of Mines has succeeded in making several synthetic mica products that show promise as substitutes for natural mica in some of its applications.

The development of ductile titanium is an example of how the Bureau of Mines and industry have acted as complements in the technology and technique of the production and utilization of important new materials. This metal, because of its high resistance to corrosion, great strength, and light weight, undoubtedly will find many uses. The Bureau of Mines has developed the process for production of ductile titanium on a pilot-plant scale and industry is now beginning production.

A quick inventory of our national mineral resources would indicate that the United States has an adequate supply for many years to come of such important minerals as coal, sulfur, salt, molybdenum, potash, phosphate rock, and sand and gravel. Although our supplies of high-grade iron ore are being depleted, our iron ore reserves are still substantial. Our use of copper, lead, and zinc has been lavish and intensified development of new sources may be required to meet future needs. Tin, nickel, quartz crystals, industrial diamonds, and platinum metals are produced in this country only in small amounts and it appears likely that we shall be forced to rely upon imports to fulfill our requirements. Tungsten, manganese, chromium, mercury, vanadium, and a sizable list of other less known minerals are also in short supply although the need for them is growing steadily.

Toward a National Minerals Policy

Although our minerals position affords no reason for a defeatist attitude, we would be foolish to be complacent. We are becoming less self-sufficient with respect to some minerals, and only by developing and carrying out a clear-cut national minerals policy can we assure the fullest development of the mineral resources we possess. Only by the application of the wisest policies can we assure the needed imports of those we lack.

Guidance for the formation of a national minerals policy has been provided by Congress in the Stockpiling Act, enacted in 1939 and amended in 1946. In this legislation Congress directed Government agencies to encourage the conservation and development of sources of needed materials within the United States as a means of decreasing our costly dependence upon foreign sources of these materials in time of emergency. With respect to minerals and metals, the Secretary of the Interior, through the Bureau of Mines and the Geological Survey, was authorized to carry out certain functions to aid in determining and developing domestic sources of supply.

In 1950 the Congress enacted the Defense Production Act which provided that the President, in achieving the purposes of the act, was to encourage the exploration, developing, and mining of critical and strategic minerals and metals, within, as far as practicable, the framework of the American system of competitive enterprise.

Fuller Development of Mineral Resources

These laws provide a statement of purpose and indicate specific courses of action to achieve fuller development and utilization of this country's mineral resources base. A broad legislative program to clarify the continuing responsibilities of the Federal Government with respect to mineral resources is needed, however. Existing legislation relates either to defense mobilization functions or to long-range objectives and attention to immediate problems of great importance to a healthy mining industry is frequently only indirectly possible. The responsibility for formulating policies affecting minerals production is so widely dispersed throughout the Government that no single Department has the necessary broad mandate to develop the positive programs that may be required.

It is the purpose of the Department of the Interior, therefore, to work toward a national minerals policy which will contribute to a strong and vigorous mining industry by intensifying exploration, discovery, and full utilization of our mineral resources. One of the keystones of this national policy must be less intervention, support, or control by the Government in keeping with the achievement of a maximum of free enterprise.

Temporary surpluses at home and abroad in the past year have created serious problems in some segments of our mining economy. These maladjustments, arising in part out of the need for accelerated production following Communist aggression in Korea, should not lull us into a false sense of security concerning our material supplies. In the long run, our strength to resist aggression as well as our ability to provide improved standards of living will depend upon ready domestic sources and increasing levels of mineral production. Efforts to expand the resources base through exploration and development must be continued and improvements in technology aimed at wider and more efficient utilization of our mineral wealth cannot proceed at too fast a pace.

The Government's Role

In the Government's appropriate role of servicing and aiding, but not supplanting, the responsibility of free enterprise, it should continue to provide geologic and other information basic to the solution of the problems ahead. Direct exploration by the Government should be confined to clearly essential projects that industry is not prepared to undertake and industry projects involving materials in short supply and of importance to national security should be aided. The valuable research and development work carried on by Government scientists and engineers, which has proven fruitful in the past, should be strengthened and directed toward the most important problems of the future.

Oil and Gas

In recent years we have witnessed a phenomenal expansion in our consumption of oil and natural gas, and the growth of these industries is continuing at a steady pace. The needs of our national economy for these fuels has become so great, in fact, that discovery and development programs must be pushed at a record pace in order to keep step with the demand. This vital task is largely and properly the responsibility of private industry. Agencies of the Department of the Interior have supplemental roles, however, involving basic geological exploration and research, and the administration, of the mineral leasing laws governing oil exploration and development on public lands.

Since its organization nearly 75 years ago, the Geological Survey has devoted a large part of its efforts to basic geologic studies which have helped lay the foundations for modern methods of oil and gas exploration. In the West the Survey conducted a significant part of the early mapping of potential oil regions. Later, the Survey expanded its program and is now engaged not only in surface geologic mapping but in broad studies of such features of geology, significant in the search for oil and gas, as surface and subsurface stratigraphy and structure, the constitution or petrology of the sedimentary rocks, and the series of events that have resulted in their present distribution and structure.

The Bureau of Land Management of the Department of the Interior shares with the Geological Survey the responsibility for administering the mineral leasing laws which govern oil exploration and development on public lands. In the past 6 months the Bureau of Land Management, which is responsible for issuing oil and gas leases on public lands, has succeeded in eliminating undue and unnecessary delays in the issuance of leases and is attempting to liberalize the laws governing oil operations on the public lands in a manner which will be of public benefit.

Oil and gas development on public lands has shown a remarkably steady growth during the 33 years since the enactment of the Mineral Leasing Act of 1920. At the end of the fiscal year, the Geological Survey had more than 89,000 oil and gas properties under supervision in 31 States and the Territory of Alaska, comprising about 63,000 acres of public, acquired, and Indian lands. Oil and gas production from 15,000 producing wells on these properties during fiscal year 1953 was valued at more than $305,000,000 and returned royalties exceeding $36,000,000.

The Bureau of Mines is continuing to make a substantial contribution to oil and gas development by research aiding the industry in solving the intricate problems of securing maximum recovery of these fuels in the most economical and effective manner. Much of this research, such as the current study of sulfur in petroleum at the Bureau's Laramie Station Office, is being conducted in cooperation with industry. The Bureau also provides an important statistical service to the public by collecting and publishing data relating to production, refinings, transportation, inventories, consumption, etc., of petroleum, natural gas, and natural gasoline.

The groundwork for future development of the Nation's extensive resources of oil shale is being laid by the experimental research being carried on by the Bureau of Mines at Rifle, Colo., and Laramie, Wyo. Oil shale is an important potential source of not only synthetic liquid fuels but of chemicals. The high yield of low-boiling aromatics produced from oil shale in the high-temperature retort at Laramie, Wyo., opens up new horizons for the chemical utilization of this resource. Indeed, it is apparent that before the establishment of a sizable synthetic fuels industry, the chemical industry will apply the results of current research to the production of bulk organic chemicals.

In carrying out the Department's oil shale research program, it is recognized that while the Government should carry on important fuel research activities, the commercial development of our fuel resources should be left to free enterprise.

The viewpoint of the new administration with respect to local rights and obligations was translated into law with the approval by Congress of legislation confirming and establishing the rights of the States to all lands and resources beneath navigable inland and offshore water within their historical boundaries and providing for the exercise of Federal responsibilities outside these borders. This legislation, the Submerged Lands Act, placed upon the Department of the Interior the responsibility for administering Federal interests in oil, gas, and other minerals in the submerged lands of the Continental Shelf, outside the traditional State boundaries.

Solid Fuels

Long a mainstay of our energy resources, coal's importance has been viewed by some observers as greatly diminished in recent years. But a more searching examination demonstrates that this is not the case. While oil and natural gas have captured substantial parts of coal's traditional markets, coal remains the leading supplier of the Nation's requirements for heat and energy for uses in which it is competitive with other fuels. And for some uses, such as a source of metallurgical coke without which the manufacture of steel would be impossible, coal is indispensable.

As our energy demands continue to grow, we shall need to rely increasingly upon our vast coal resources. As a boiler fuel for electric utility plants in particular, coal's virtually unlimited resources provide assurance of the tremendous future supplies which will be needed.

Coal also seems almost certain to become of augmented importance as a source for synthetic liquid fuels and for chemicals. Experimental work in coal hydrogenation by the Bureau of Mines has demonstrated the increasing feasibility of the production of gasoline and important chemicals by this process. Similar important research has been conducted by the Bureau in other important methods of extracting liquid fuels and chemicals from coal.

During the fiscal year, the Bureau's work on the coal hydrogenation process, conducted primarily at the Louisiana, Mo., plant, was deemed to have reached the point of diminishing returns and the plant was closed and declared surplus. The results of the extensive research at the plant have been made available to industry and private concerns have indicated that they will carry forward the research. Thus savings of about $10,000 a day in Government expenditures have been achieved while at the same time it is assured that the Government's previous expenditures will not be wasted and the research leading to commercial use of coal to oil conversion techniques is carried on in the most efficient and appropriate manner.

PUBLIC LANDS

Our extensive public lands, totaling more than 500 million acres, including Alaska, must be viewed as an invaluable heritage. These lands provide vital resources of soil for farming and forage as well as minerals and timber for many uses. In addition they offer rich opportunities for recreation and for the conservation of fish and wildlife.

The Bureau of Land Management of the Department of the Interior is charged with a number of vital responsibilties with respect to the public domain. It is responsible for the management, leasing and disposal of the vacant public lands and their timber and other resources; the execution of laws relating to the prospecting, locating, appropriating, entering, reconveying, and patenting of public lands within the public domain, including national forests and other reservations; and the conduct of scientific and professional work in the fields of land and mineral economies. The Bureau also administers the mining and leasing laws on land in the public domain and purchased lands under the administration of the various Federal agencies, supervises grazing on about 160 million acres of Federal rangeland located in the Western States and administers about 30 million acres of timber and woodland areas.

In carrying out these responsibilities, the Department must assure, through wise planning and administration, that our public lands are used in a manner which will promote the economic stability and development of the entire Nation. The sound conservation and development of public lands clearly can contribute greatly to the prosperity of this and succeeding generations.

Over the years, Congress has enacted a host of laws designed to assure the private segments of our economy equitable treatment in the use of resources of the public domain. Under these laws, it is the basic mission of the Department to dispose of or to integrate the public domain with the private economy as rapidly as is feasible with the continuing objective of the wisest and soundest use. The fact that more than one billion acres of public land have been disposed of directly to the States or to private individuals or associations of individuals is symbolic of the national policy of relying upon private initiative and ingenuity for developing the land and its resources.

Under present-day conditions, nevertheless, the Department is aware that the attainment of this aim must be coordinated with our efforts to obtain the greatest possible use out of each acre of land. While this policy of multiple use will make continued Federal ownership and management essential in certain areas, it must be recognized that the Federal Government has no monopoly of wisdom, financial ability, or skill with regard to the proper conservation of land resources. The Congress, in fact, has supported this concept by confirming and establishing the rights of the States to all lands and resources beneath navigable inland and offshore waters within their historic boundaries.

The value of our public domain resources is indicated, although inadequately, by the uses which free enterprise has made of these resources. In terms of timber, for example, the open public domain administered by the Department has an annual producing capacity of over a billion board feet of lumber and other forest products. Livestock, principally cattle and sheep, foraging on the public domain in the west number more than 9 million. Public revenue from leases of public land for oil and gas development and for other purposes amounts to about $67 million, and all of the activities involving use of public lands represent at least a $10 billion segment of our gross national product.

These indicators, however, measure only the present uses which are evaluated in the market place. They do not describe the great unused potential of the public domain which only the future will reveal. Nor do they include the relatively intangible and indirect benefits which are constantly being realized as private individuals enter a new area of the public domain and create an economic enterprise and all of the auxiliary community activities which go with it.

New settlement and new development mean new homes, new businesses, new community facilities, the opportunity, in short, for the kind of progressive development which has made America. In gaging every possible new development, therefore, we must not confine ourselves to strictly dollars and cents considerations, but continue to rely on the initiative of private individuals in a free society to make maximum use of the opportunities afforded by the resources for which the Department is merely the steward on behalf of all of the people of the United States.

The Department is conducting classification studies and other basic surveys to provide the factual basis for a careful reappraisal of our Federal public lands. This reappraisal is needed to determine which of the Federal public lands should be retained in Federal ownership and which can be more economically and satisfactorily administered by transfer to State or private ownership.

In the meantime, public land development and use will be intelligently and efficiently managed on a businesslike basis and with due regard for proper principles of conservation and for the rights and interests of States and private users. The laws and regulations which govern private development and use of public lands will be continuously examined in terms of their practical effects. The abuse of these laws will be eliminated to the greatest possible extent, and the need for any changes in the laws will be carefully studied.

Disposals of Federal lands in fulfillment of pledges made to the States on their admission to the Union are in many instances long overdue. The speeding of these disposals will be a continuing objective. When these lands are surveyed and transferred to the States, local communities will realize substantial benefits in form of additional revenues to provide needed public improvements such as schools and roads. In addition, the local communities will obtain a measure of increased local control and responsibility.

Forests

The Department of the Interior is responsible for a total of 57 million acres of forest and woodland in the United States, including 13 million acres classified as commercial forest. In addition, the Department controls 125 million acres of forest and woodland in the Territory of Alaska. The administration of this critically important forest responsibility is divided among four Interior agencies, the Bureau of Land Management, the Bureau of Indian Affairs, the Fish and Wildlife Service, and the National Park Service. Each of these agencies has certain basic objectives in their administration of their forest areas in accord with their own basic missions, but they share the overall aims of protection of the forests from fire, insects, and disease; the improvement of the quality of timber produced from the Department's commercial lands; and the maximum development on all our forest lands of fish and wildlife, range, recreation, and other special resources.

As in the case of other public lands, the Department supports the development of a desirable pattern of ownership of Federal, State, and private forest, range, and other conservation lands and the formulation by Congress of policies to guide the action of public agencies in this regard.

The forest lands administered by the Bureau of land Management fall into three major categories: (1) The revested Oregon and California Railroad grant lands and other areas generally identified as the O. and C. lands; (2) the public domain forest lands in the continental United States; and (3) the public domain forest lands in the Territory of Alaska.

It is the policy of the Department, in accord with the Act of 1937, to restrict the cutting of timber on the O. and C. lands to a total volume of 640 million board-feet a year and to direct all timber-cutting operations under approved rules of forest practice, established after full consultation with a local advisory group. The general management objectives for the commercial public domain timber in the West are generally the same as for the O. and C. lands.

In Alaska, a major problem faces the Department in determining the proper management procedures for the Territory's tremendous areas of forest lands. Forest management plannings for the Territory will be greatly aided by the inventory of Alaska's available timber resources which will be undertaken by the Forest Service of the Department of Agriculture under the authorization approved by the 1st session of the 83d Congress.

In administering about 6 million acres of forest lands in the United States, the National Park Service faces a challenge in devising ways and means of achieving successfully its twofold objective of handling the parks' greatly augmented visitor load and at the same time conserving the forests in their natural state. Similarly, the Fish and Wildlife Service is interested in both using the timberlands found on the refuges to demonstate practical means of developing and maintaining optimum game populations and in obtaining maximum timber yields in accord with this purpose and with sound forest management practices.

Since the Indian forest property, including about 6,250,000 acres considered commercial, is closely interrelated with the welfare of the Indians themselves, plans for forest management of this property must be coordinated with the whole Indian Service program of social and economic betterment. This necessitates a far greater flexibility in long-term forest management plans than is customarily required or considered ideal from a purely technical standpoint. For Indian forest lands as whole, however, the present rate of cutting is approaching the maximum under sustained yield principles unless or until more accurate inventories indicate that an increase in the cutting rates is warranted.

NATIONAL PARKS

Despite the need for economy in Government, it would be unwise to close the door on further prudent investments that will maintain and expand the opportunities afforded by our national parks for recreation. The extent to which public agencies provide the means for recreation and the intelligent guidance for its proper use and enjoyment is of continuing, if not greater, importance today as our Nation continues to grow in population and to have more time for leisure and recreation. In 1952, more than 42,500,000 people visited our national parks and monuments—twice the number in the last prewar year of 1941.

Any national park is an economic, social, and spiritual asset to the Nation. We can only estimate its economic value and still less are we able to put a price on its cultural and spiritual values. We do know that these values exist and that the opportunity to enjoy them is a modern-day necessity. By affording a change from the pressure of complex modern life, the national parks afford an opportunity to regain a sense of real and permanent values.

The primary function of the National Park Service is to provide for the enjoyment of our national parks and monuments in such manner and by such means as will leave them unimpaired for the enjoyment of future generations. This broad responsibility, assigned by Congress in 1916, has since been supplemented with additional responsibilities involving close cooperation with other Federal, State, and local agencies. One of these is the task of assisting other agencies, if requested, on all levels in the development of a plan for coordinated and adequate public-park, and recreational-area facilities for the people of the United States. The Department is keenly aware of the importance of this tremendous job and is cooperating fully with other responsible agencies to assure its early accomplishment.

In its cooperation with other agencies, the National Park Service also works closely with the Army Corps of Engineers and the Bureau of Reclamation in appraising the recreational value of reservoirs built by these two agencies. To insure that reclamation projects will provide for the development of recreational opportunities, the basic plans of all major reclamation projects include provisions for outdoor recreation. Virtually every reservoir built today is stocked with fish through the cooperation of State authorities or of agencies of the Federal Government. Similarly, these man-made lakes offer opportunities for boating, bathing, and picnicking. It has been estimated that this extra recreational resource has an economic value of over $36 million a year in addition to the intangible values of health and human enjoyment.

FISH AND WILDLIFE

An important phase of the Department's work is the Fish and Wildlife Service's leadership in the management of the priceless fish and wildlife resources of our country. These resources are becoming more important as the public in seeking satisfactory recreational outlets is turning increasingly to the opportunities to hunt and fish. Recent reports show that these forms of recreation exceed all other outdoor sports in popularity with 1 out of every 5 persons interested in either hunting or fishing.

In the national wildlife conservation programs, the Department, in cooperation with Canada and Mexico, manages the continental waterfowl resources to provide a sustained opportunity to hunt for more than 2 million duck hunters annually. An additional 4 million people take advantage of the opportunity offered by the national wildlife refuge program and more than 17 million enjoy sport fishing.

Federal aid to the States for fish and wildlife conservation, financed by the Nation's hunters and fishermen through excise taxes on hunting and fishing equipment, duck stamps, and licenses, has produced remarkable results since it was authorized by law in 1938. Under this program, the States have been able to purchase land and water areas and to develop them in a manner which increases fish and wildlife.

The activities of the Fish and Wildlife Service in promoting development and use of the Nation's commercial fishery resources are both varied and widespread.

Offshore salmon research was conducted in the past year near the western Aleutian Islands as part of the preliminary investigations in connection with the new convention for North Pacific fisheries. Explorations were also conducted in the northeastern Pacific, the Gulf of Mexico, and the Gulf of Maine for tuna and other fish. Experiments in locating commercial fish by means of underwater listening devices were continued and an underwater television camera was developed for studying fishing gear in operation.

Commercial-scale tests during the year demonstrated that the new method of freezing whole fish at sea for later thawing, filleting, and refreezing ashore is mechanically feasible. This project will be extended to include a production-cost study of the operation on a commercial basis.

In Alaska, the Fish and Wildlife Service is responsible for the protection and conservation of the fishery resources which form the basis for the Territory's most important industry. The intense exploitation of the fisheries in the Territory continues to demonstrate the need for sound and vigorously enforced regulatory controls.

It is the Department's intention to watch carefully over our great fish and wildlife resources and to take the necessary measures to assure their conservation. Research and exploratory fishery investigations are being pressed to make possible the opening up of vast unused marine resources. Both fish and wildlife resources will be protected to the greatest practicable extent, in cooperation with private, local and State interests, as reclamation and other natural resource development programs go forward. Hunting and fishing opportunities will be preserved. Regulation, insofar as it is a Federal responsibility, will be reasonable in its extent and administration.

INDIAN AFFAIRS

The American Indian and the land and its related resources to which he has an established right are a potentially vital part of the Nation's productive capacity. The more than 50 million acres of tribal and individually owned Indian lands have a value in excess of more than $400 million for agricultural, grazing, and forestry purposes, exclusive of unestimated mineral resources. These resources with a potentiality of providing a growing degree of self-sufficiency for the Indian population have been barely tapped. It is the belief of the Department that its policy of terminating Federal responsibility for administering the affairs of individual Indian tribes as rapidly as the circumstances of each tribe will permit should promote the wider and more efficient development of Indian land and its related resources. More important, however, is the conviction that this policy will bring to the American Indian the status that is rightfully his, with all of the rights, freedoms, and responsibilities of other American citizens.

The Department is working to accomplish the termination of Federal responsibilities for the administration of Indian affairs by promoting arrangements with the proper public bodies of the State and local units of Government to assume responsibility for the services customarily enjoyed by the non-Indian residents of such political subdivisions. Policies are also being developed to govern the distribution of tribal assets to the tribes as a unit or by division of the tribal assets among the individual members, whichever may appear to be the better plan in each case. In addition, responsibility for trust properties should be transferred to the Indians themselves, either as groups or individuals as soon as feasible.

The Department recognizes that this objective of terminating Federal responsibility for Indian affairs, as desirable as it may be, cannot be achieved overnight. The unusually complex set of relationships between the Federal Government and the more than 200 Indian tribes or tribal groups, which is embodied in thousands of laws and hundreds of treaties enacted and ratified over a period of more than 100 years, alone makes the achievement of the objective a difficult task. But there is a growing recognition among both Indians and non-Indians that the keynote of any successful program of Indian administration must be the progressive elimination of these special relationships between the Indian people and the Federal Government.

Recognizing that there are tremendous and significant differences among Indian tribes, the Department will carry out its policy of withdrawal only as rapidly as the circumstances of each tribe will permit. The plans and programs which may be sound and necessary for the Navajos, for instance, may be wholly unsuitable for the Sioux, and vice versa. In some cases Federal supervision over tribal affairs has already been relaxed to permit many important decisions affecting the welfare of the group to be made by the Indians themselves. In other cases, however, tribes are almost completely dependent on Federal supervision. And between these two extremes there are many significant gradations. Obviously, therefore, these differences must be carefully considered in determining just when Federal responsibility can be withdrawn from any particular tribe.

While avoiding the error of terminating Federal responsibility before the economic maturity of the tribal group and its capacity for managing its own affairs have been demonstrated, the Department is equally anxious to avoid postponing independence for an Indian tribe because some individual members are not ready to assume the responsibilities that go with the new status. There are, of course, differences in capacity for economic self-sufficiency among Indians as well as among non-Indians. If the termination of Federal supervision is delayed until every member of a particular tribe has demonstrated his ability to earn a livelihood or to manage his own resources, an unrealistic criterion would be unduly postponing the transition. It is also true that the Indians will only learn to manage their own affairs and to exercise all of the prerogatives of full citizenship as they are given the opportunity. With this thought in mind, therefore, the Department will press actively for the earliest feasible termination, resolving doubts in favor of Indian freedom rather than Federal paternalism.

An essential part of the transition, of course, is the satisfactory completion of arrangements with State and local Governments to guarantee that the Indians will receive from these political subdivisions the services customarily provided to non-Indian residents. These services, such as education, public health protection, law enforcement, welfare assistance, and road maintenance, have been provided by the Bureau of Indian Affairs. About two-thirds of the Bureau's employees, in fact, are now engaged in health, education, and welfare work and these services account for a similar proportion of the Bureau's budget. There can be no dispute about the necessity for Indians to receive such services. The need for such services, in fact, particularly for education and health, is more pressing among Indians than other racial groups, and it is the aim of the Department to bring services up to a level more commensurate with the needs of the Indians.

Substantial obstacles must be overcome before all of the Indians will be receiving these social services from the same sources as non-Indians. We must recognize, for example, the tax-exempt status of Indian lands in Federal trusteeship and the overburdened budgets of many State and local agencies, as well as the lack of adequate facilities in some of the remote Indian lands.

The transfer of these responsibilities nevertheless will be pressed in order to achieve the many rewards which the changeover will bring. It will help to bring the Indians more closely into the fabric of community life at the grass root level as it breaks down the old reservation walls that have set them apart and which in some cases have undermined initiative and self-respect. In addition, it should bring about a pattern of services more responsive to the Indians' actual needs since the level of services will be determined locally rather than by some remote official.

In making decisions as to the ultimate disposition of tribal assets, the Department will be guided largely by the expressed wishes of a majority of tribal members. We know that in some cases the majority of the members would favor dividing the tribal assets and permitting individual members to take their places in the local community on an equal footing with other Americans. A number of tribes, however, may oppose such a plan because the tribal assets consist mainly of forest or range lands which can be more effectively operated as a unit or in large blocks. Other types of assets may also be of a nature which will not permit sale or subdivision without the danger of serious losses.

The problem, moreover, is not strictly one of economics. We recognize that there are many Indians, deeply attached to their tribal organizations, who will want to have these organizations continue to function even after Federal services and supervision have been withdrawn. Whenever such sentiments exist, they should be given the fullest possible consideration. It must be emphasized, nevertheless, that the needs of the Indians for cultural and social group activity should not be used as a pretext for keeping them indefinitely under Federal paternalism, however benevolent and enlightened.

Progress in Terminating Federal Responsibilities

Notable progress is being made in moving toward termination of Federal responsibilities in Indian affairs. The 1st session of the 83d Congress provided for the transfer of the responsibility for maintaining law and order on Indian reservations from the Federal Government to the appropriate county agencies of California, Minnesota, Nebraska, Oregon, and Wisconsin. The 1st session of this Congress also repealed the Federal laws which discriminated against Indians as a minority group by denying them the right to buy and possess intoxicants.

In the fiscal year ending June 30, 1953, the Bureau of Indian Affairs transferred 19 of its schools, with a combined enrollment of about 1,100 Indian children, to local Government agencies. One hospital and the responsibility for maintaining 75 miles of roads on various Indian reservations were similarly transferred.

This is a good beginning but the Department is hopeful that even faster progress can be made in the future without creating conditions which would constitute a default of our obligations to our Indian citizens. To assure that each step in the transition is made with full knowledge of the desires and interests of our Indian citizens the Bureau of Indian Affairs will continue to maintain close contact with each Indian group.

Plans for the termination of Federal supervision of a number of Indian groups are being completed and are being submitted to Congress. Legislative measures aimed at reducing Government controls over Indian Affairs, generally, are also being considered.

TERRITORIAL AFFAIRS

Recognizing the many vital contributions that areas outside the United States for which it is responsible can make to our overall welfare, the Department is working actively to promote the economic, political, and social development of the Territories of the United States, its Territorial trusteeship, and dependent areas under its jurisdiction. This vital task is being carried on in full cooperation with the Governments of the Territory of Alaska, the Commonwealth of Puerto Rico, the Virgin Islands, the Territory of Hawaii, Guam, and American Samoa, and the Trust Territory of the Pacific and the Pacific Islands.

The Department's Territorial activities, involving the services of most its bureaus coordinated through the Office of Territories, are all directed toward achieving the development of the areas in a manner which will make possible a maximum of self-government. In Hawaii, for example, the people have already realized a degree of economic, political, and social development which eminently qualifies them for the full privileges of American citizenship which statehood would confer. During the 1st session of the 83d Congress, legislation enabling statehood for Hawaii passed the House of Representatives and was considered by the Interior and Insular Affairs Committee of the Senate. The Department strongly supports the prompt enactment of Hawaiian statehood with the hope that election of State officials can be held in November 1954 under the provisions of the enabling legislation.

Although the Territory of Alaska has made great progress in economic growth in the past 10 years, the uncertain status of Alaska native land claims constitutes a cloud over many land titles in Alaska thereby deterring land settlement and rapid development. In fairness to both the native and other claimants and to solve the existing uncertainties, the Department believes that legislation is required to provide for the early adjudication of such claims.

Committees of Congress have carefully considered a thoroughgoing revision of the Organic Act of the Virgin Islands. The revisions under consideration are believed to be desirable since they would place local government on a more economic footing and confer a greater degree of self-government.

Organic legislation for the Trust Territory of the Pacific Islands is also needed to provide an appropriate guide in carrying out the obligations of the United States as administering authority of the trust territory under the trusteeship agreement with the United Nations.

In view of the functioning of the Commonwealth of Puerto Rico for more than a year under a constitution drafted and adopted by the people of Puerto Rico themselves, the United States has notified the United Nations that it would cease to submit reports on Puerto Rico as a territory which is not self-governing. The Puerto Rico Reconstruction Administration, originally established in 1935 to alleviate unemployment, is being liquidated since its continuation would involve the Government in business activities which are competitive with private capital.

CONCLUSION

It is fortunate in this crucial sixth decade of the 20th century that increasing enlightened attention is being given to the problems associated with providing adequate resources to meet the steadily growing needs of the people of the United States and of the world.

The day in which we could afford to take our natural resources for granted is past. In the next 25 years the population of this country is expected to increase by about 40 million to a level of over 200 million. This increase is to be accompanied by a corresponding rise in the demand for all types of raw materials, finished products, and energy. Wise planning and efficient action will be required to assure that the natural resources to fulfill these needs are available in adequate supply and at a cost which will insure a continuing rise in our living standards. In this vital task, the Department of the Interior has an important role to play as the Federal agency charged with prime resource responsibilities. But this task is clearly not for the Department of the Interior alone, or even for a combination of Federal agencies alone. It is a task which all of the American people must share. Under the system of free enterprise that has made America industrially strong, private initiative and ingenuity must, as in the past, provide the mainspring for this overall effort to meet successfully the resource problems of the future. The Federal Government, and State and local governments, each playing the appropriate part assigned to them as representatives of the people, have much to contribute but it is evident that these contributions, as important as they may be, are only supplemental.

By working together as a team, the American people can assure that our natural resources will be developed fully and effectively, contributing richly as they are converted into the necessities of life to the welfare of the American economy and the well-being of the American people.

Douglas McKay

Secretary of the Interior.

PART II

ANNUAL REPORTS OF THE BUREAUS AND OFFICES OF THE DEPARTMENT OF THE INTERIOR

DIVISION OF GEOGRAPHY

Meredith F. Burrill, Director

The Division of Geography was established to carry out the duties of the Secretary of the Interior under the act of July 25, 1947, conjointly with the Board on Geographic Names. The Division does the research and other staff functions relating to the standardization of geographic names.

The Division's work in 1953 was concentrated on areas outside the continental United States. Geographic and linguistic research preceded standardization of more than 160,000 geographic names for use by Federal agencies. More than 220,000 tabulating cards were punched for publication in gazetteers and over 650,000 map and text names were edited for correctness of spelling and accuracy of application. These figures represented substantial increases over similar services rendered to Federal agencies in previous years and resulted from improved efficiency of operations.

In addition about 15,000 names were supplied by inquirers by telephone and mail and cases were processed for about 1,300 formal decisions.

Substantial progress was made in converting Arabic and Persian names to romanizations by the system adopted by the Board on Geographic Names, and some 5,000 such names are now available.

While the Division's work has served with increasing efficiency the agencies providing funds, it has not been able to satisfy all needs for foreign names and has met almost none of the needs for domestic names.

UNITED STATES BOARD ON GEOGRAPHIC NAMES

The Board on Geographic Names is an interdepartmental organization established for the purpose of standardizing geographic nomenclature for use by the Federal Government. Representatives of 11 Federal departments and agencies make up its membership.

George R. Ranow, Government Printing Office, became chairman during the fiscal year 1952.

The Board and its committees held frequent meetings during the year to act on policies, names, publications, and related matters. Basic foreign name policies were formulated to cover new areas and policies were extended and amended for areas and classes of names previously covered. The volume of the Board's activity is reflected in the statistical data included in the report of the Division of Geography.

The three advisory committees continued to assist in their special fields. The Advisory Committee on Antarctic Names reviewed, revised and extended its recommendations for the Palmer Peninsula area and started a project on Wilkes Land. The Advisory Committee on Names in Alaska will be reconstituted as the Alaskan Names Advisory Committee. The Advisory Committee on Arabic and Persian resolved numerous problems and examined and approved several thousand individual names.

More than 4,000 decisions were published in lists covering Argentina, British Borneo, Colombia, Indonesia, Japan, Mexico, Panama, the Philippines, South Africa, and other areas. A revised catalog of publications was also issued.

OIL AND GAS DIVISION

H. A. Stewart, Acting Director

During the fiscal year the Oil and Gas Division continued the peacetime oil and gas functions, while the Petroleum Administration for Defense carried on the mobilization of petroleum and gas for national security and defense.

The Secretary of the Interior and the Bureau of Mines received from the National Petroleum Council valuable data on the petroleum productive capacity of the submerged lands and on the production costs of synthetic liquid fuels, which are departmental matters of great significance to the national economy. The National Petroleum Council submitted nine reports on technical studies.

The Division maintained contact with the State regulatory bodies directly and through the Division's Federal Petroleum Board. The Oil and Gas Division represented the Department at the quarterly meetings of the Interstate Oil Compact Commission.

The Oil and Gas Division represented the Department on the Department of Commerce committees and task groups dealing with export policy and export control. By close collaboration with departmental officials, the Division gave the Department of Commerce full benefit of its knowledge on matters they are concerned with.

The Federal Petroleum Board, with headquarters at Kilgore, Tex., administers the Connally "Hot Oil" Act, under the direction of the Secretary and the supervision of the Oil and Gas Division of the Department of the Interior.

In adopting the Connally Act on February 22, 1935, the declared aims of Congress were to protect interstate and foreign commerce from the diversion and obstruction of, and the burden and harmful effect upon, such commerce caused by the production of oil in excess of amounts fixed under State law, and to encourage conservation of deposits of crude oil situated in the United States. These objectives were to be accomplished chiefly by prohibiting the shipment or transportation in interstate commerce of all oil and the products thereof produced in excess of the amounts authorized under State law, and by authorizing injunctions in proper cases to restrain violations of the law. Experience had already abundantly demonstrated that without the aid of the Federal Government the States could not satisfactorily solve the complex and vexatious problems resulting from the enormous waste that had characterized unrestrained explotiation of rich oil and gas deposits in the various oil-producing States.

Conservation of petroleum oil and associated hydrocarbon minerals in the United States is of far greater concern to the Nation today than it was when the Connally Act was enacted in 1935. This is so for a variety of reasons, but mainly because of the more general recognition of the extent to which the national welfare, both in peacetime and in time of war, is dependent upon an adequate and available supply of these resources.

While the Connally Act is applicable wherever State laws limit the rate of production and prescribe conditions for producing and handling of oil, its chief application is in the States of Texas, Louisiana, and New Mexico, whose regulations prescribed under the act are actively enforced by the Board. So far as possible with the limited resources at its command, the Board also enforces the provisions of the act in other oil-producing States, particularly in Mississippi, Oklahoma, Arkansas, and Kansas.

To secure the widest possible voluntary compliance with the provisions of the act and thereby to promote uniform application of sound conservation practices, is the primary aim of the Board. Investigations are constantly in progress throughout the areas where complaints arise, or where experience demonstrates violations are most likely to occur. Administration of the act is further implemented through regulations which require producers, transporters, refiners, and others handling oil and products in the designated area to keep operating records and file periodical reports with the Board. Presently, the designated area consists of 106 counties in the State of Texas, the counties of Lea and Eddy in the State of New Mexico, and the entire State of Louisiana.

From this designated area the Board regularly receives and processes each month approximately 6,200 monthly producers reports, about 535 monthly pipeline reports, and slightly less than 100 reports from processors and refiners. These reports cover operations in about 1,700 separate oilfields and account for approximately 36 percent of the entire domestic production of crude oil, or approximately 71 million barrels each month.

During this fiscal period, more than 3,000 leases in Texas, New Mexico, Louisiana, and Mississippi were gaged and checked, and inspections of a less extensive nature were made on some 6,500 other leases. In carrying on this work some 750 separate fields were visited, and some 3,000 separate interviews were conducted.

At the beginning of the fiscal period, 12 cases dealing with violations of the act were pending, 7 in an investigative status, 1 under review by the Department of Justice in Washington, 2 pending disposition by United States attorneys, 1 pending trial in Federal court, and 1 on appeal in the Circuit Court of Appeals for the Tenth Circuit. At the close of the fiscal period there were 15 cases pending on the Board's docket.

During the period formal investigations were initiated in 14 new cases, making a total of 26 cases receiving consideration during the period, 11 of which were closed during the year, 9 by successful prosecution, 1 by administrative action not involving prosecution, and 1 where conviction was sustained on final judgment. Fines imposed and paid during the year totaled $70,150, comparing with $38,930 for the year 1952; $33,000 for the year 1951; and $52,950 for the year 1950. Imprisonment of a year and a day was imposed upon a defendant in one of the most aggravated cases to come before the Board in recent years.

Cooperation between the Board, the petroleum industry, and State conservation agencies of the various oil-producing States, always recognized as of prime importance in achieving the ultimate purposes of the act, was maintained and extended, with mutually beneficial results.

During the fiscal period ending June 30, 1953, the Board, consisting of a chairman, member, and alternate member, carried on its operations through a staff of only 24 persons in addition to the members of the Board. Of this staff, 14 were investigating examiners, the remainder consisting of clerical and accounting personnel. Total funds available for administration of the act during the period amounted to $187,000 of which approximately $175,500 were obligated. These expenditures included both the field service and expenses incurred in Washington in connection with administration of the Connally Act. At the end of the year the staff had to be sharply reduced because of reduction in appropriations for fiscal year 1954.

OFFICE OF THE ADMINISTRATIVE ASSISTANT SECRETARY

D. Otis Beasley, Administrative Assistant Secretary

The Administrative Assistant Secretary exercises the authority of the Secretary of the Interior in the field of administrative management and this office provides integrated direction of the functions of the Department in that field. The office is comprised of the immediate office of the Administrative Assistant Secretary and six divisions, viz, Administrative Services, Budget and Finance, Management Research, Personnel Management, Property Management, and Security.

A report for each division follows:

DIVISION OF ADMINISTRATIVE SERVICES

Floyd E. Dotson, Director

This Division directs administrative services for the Department and furnishes all administrative and housekeeping services required by the Office of the Secretary, Defense Solid Fuels Administration, and the Defense Minerals Exploration Administration. These services include library, museum, health, space, telephone, photographic, warehousing and shipping, duplicating, and printing and binding.

Branch of Library Services.—Use of the central library continued to increase, as well as the Geological Survey and the Division of Geography libraries, which are under the technical supervision of the central library. Statistics for the central library are: Patrons of reading rooms, 29,374; telephone calls, 22,093; circulations of books and periodicals, 61,000; interlibrary loans, 5,000; queries answered, 18,000; acquisitions, 15,000 books, 54,000 periodicals. Total of shelved holdings rose to more than 403,000.

Branch of Personnel Operations.—This branch is responsible for the personnel program for the Office of the Secretary, which includes classification, placement, training, employee relations, processing, and reporting. Easing of the Whitten amendment to allow permanent promotions within the September 1, 1950, ceilings, and a reduction in force and reorganization within the Office of the Secretary increased the workload.

Fiscal Section.—This Section performs budget and accounting functions of the Office of the Secretary, including the working capital fund, which finances certain services for the Department. It is also responsible for control and reporting on approximately $4 million in transferred funds used by more than one bureau within the Department. Expenditures from all funds by the Office of the Secretary during the year were approximately $4,100,000. Operations under the working capital fund were about $1,200,000. Receipts from operations on submerged lands which are held in a special account pending disposition were slightly over $37 million.

Records Management.—Records holdings within the Office of the Secretary were surveyed and retention and disposal schedules developed. Approximately 2,300 cubic feet of records were transferred to Federal records centers or disposed of as useless papers, releasing 325 file cases and 2,500 square feet of floor space. A new filing system for legislative records was developed and placed in operation. The Personnel Files Unit was merged with the Central Files Section with increased efficiency and reduced force resulting. The technical review staff files were taken over by the Central Files Section, a step in centralization of all files for the Office of the Secretary.

Museum.—The Interior Department Museum serves as the medium for the public to visualize "the history, aims, and current activities" of the Department. It is a repository for collections in the fields of conservation and development of natural resources and the culture and handicrafts of the American Indian. Some 41,000 persons visited the museum during the year. Thirty special exhibits were prepared and shown during the year. More than 22,000 people saw the educational motion pictures shown daily. Many teachers are bringing classes for conducted tours of the museum.

Branch of Central Services.—This branch is responsible for the purchasing work for the Office of the Secretary, and for operating central duplicating, communications, health, photographic, warehousing, shipping, and printing and binding services for the Department. Work output continued at normal levels, despite the extra duties thrown on the branch with the cutback or termination of several of the Department's defense activities.

DIVISION OF BUDGET AND FINANCE

Sidney D. Larson, Director

The Division of Budget and Finance is responsible for the development and supervision of the budget, financial, and investigation functions of the Department. The Division consists of the Office of the Director and three branches responsible for budget, finance, and investigations.

Appropriations to the Department for the fiscal year 1953 total $545,817,501. Receipts for the year are expected to exceed $249,000,000.

The Division continued work in developing uniformity and improvement in the formulation and execution of the Department's budget program; assisted bureaus in the installation of improvements in accounting systems; and investigated alleged irregularities involving employee misconduct or statutory violations.

At the request of the House Appropriations Committee the Division assisted in developing a business-type budget presentation for the Bonneville Power Administration; participated in a joint review with the Bureau of the Budget in improvement of budget justifications; and assisted bureaus in revising budget estimates for 1954 to comply with policies established by the President.

The Division participated in the joint program of the Bureau of the Budget, Treasury Department, and General Accounting Office for improving accounting and fiscal reporting. Accomplishments included the installation of accounting systems for the Southeastern Power Administration and the Bureau of Mines. Accounting manuals were approved for the Southwestern Power Administration, Southeastern Power Administration, Bureau of Indian Affairs, Alaska Road Commission, and the Government of American Samoa. Accounting surveys were made for the Fish and Wildlife Service and the Government of the Virgin Islands.

In cooperation with the General Accounting Office the Division assisted the bureaus and offices in improving accounting systems in the Bureau of Land Management, Bureau of Indian Affairs, Alaska Railroad, and the Alaska Road Commission.

The Division cooperated with the General Accounting Office and with the bureaus of the Department with respect to the comprehensive audit program. All bureaus of the Department were covered by this program with the exception of the National Park Service, Geological Survey, and Office of the Secretary.

The Division conducts investigations of alleged irregularities in the performance of official duties by employees of the Department and of other matters under the jurisdiction of the Department. Cases indicating criminal violations are referred to the Attorney General. Work performed on investigations is as follows:

Assigned	48
Reported	35
Disposed	26
Pending	21

DIVISION OF MANAGEMENT RESEARCH

Arthur B. Jebens, Director

The Division of Management Research advises on matters relating to the organization and general management of the Department and makes studies of departmental operations to insure the most efficient and effective implementation of programs. The Division is responsible for overall development and staff supervision of the Department's management improvement program. Additionally, the Division also continued to coordinate the departmental system of Secretarial orders and other administrative issuances.

During 1953, the Division participated in the establishment of the Technical Review Staff which was created to provide centralized staff assistance to the secretariat in its supervision of program operations and replaced the Program Staff and the four divisions: Land Utilization, Minerals and Fuels, Water and Power, and International Activities, which had heretofore performed this service. Other organization changes included the establishment of a Division of Security in the Office of the Administrative Assistant Secretary and the readjustment of departmental defense agencies and activities to meet reduced budget allotments. The Division assisted in the development of a departmental program of surveys of bureau organizations and operations and in compiling basic source material for organization studies of the bureaus during the coming year. Members of the Division staff will participate as members of these teams or as advisers on organization and general management matters as representatives of the Administrative Assistant Secretary.

The Division also rendered assistance to the bureaus in improving procedures and making organization adjustments. Examples of these changes are: (1) Adjustments in the Bureau of Mines' field organization, (2) establishment of Administrative and Publications offices in the Geological Survey, (3) internal adjustments and consolidations in the Washington office of the National Park Service, (4) assistance to the Bureau of Mines in the installation of a new manual to replace its outmoded administrative issuance system, (5) reorganization of

Bureau of Reclamation activities in California, and (6) developing a proposed plan of reorganization for the Office of Territories.

The Division continued to provide the bureaus with standards and guides for their annual management improvement program and to assist in the review and follow up on proposed amendments. It prepared the Management Improvement Handbook which provides instructions for a systematic approach in solving management problems. The Division also sponsored a management improvement workshop during the spring where the bureau representatives gathered to consider common problems and exchange ideas for making the program more effective. The annual management improvement reports of the bureaus indicated measurable and practical accomplishments as a result of the program.

In reviewing the organizational implications of proposed legislation, the Division handled an expanded workload of preparing reports on legislative bills, Executive orders, and reorganization plans. The codification of Secretarial delegations of authority and subsequent redelegations have been substantially completed with the issuance of the Handbook of Secretarial Delegations of Authority and the bureau compilations of their redelegations.

The Department's incentive awards program continues to produce a steady increase in savings to the Department. These savings include not only measurable monetary savings but intangible benefits derived from improved employee relations, improved safety factors, better working conditions, and better public relations. The report on the Department's incentive awards activities for the fiscal year of 1953 is as follows:

Number of suggestions received	1,274
Number of suggestions awarded	366
Amount of cash awarded	$14,629
Annual savings	$502,225
Superior accomplishment awards	166
Leading to savings	13
Amount of savings	$269,250
Efficiency awards approved	11
Annual savings	$2,162,841
Honor awards granted:	
Distinguished service	71
Meritorious service	98
Commendable service	277

DIVISION OF PERSONNEL MANAGEMENT

Guy W. Numbers, Director of Personnel

Of major significance in the field of personnel management during the fiscal year of 1953 was the transition between the old and new administrations. Many problems faced the Division in carrying out policy changes of the Civil Service Commission and in effecting reductions in force as the result of changes and economic retrenchment in the Federal Government. The reductions in force which occurred in the latter part of the fiscal year took out of the Department some 2,000 of its employees, principally in the field services of the Bureaus of Reclamation, Mines, and Indian Affairs. In contrast to this, however, was the problem of continued difficulty in recruiting and retaining qualified chemists, engineers, metallurgists and persons trained in the social sciences in the Federal service.

The Division devoted considerable attention to the study of personnel problems peculiar to the Territory of Alaska. Departmental surveys were made of each bureau's personnel operations in the Territory and through coordination of bureau and departmental efforts, agreements were reached as to standard methods of recruiting, applying employee benefits and equalizing wage structure.

A formal labor-management agreement with organized employee groups, engaged in the production of helium for the Bureau of Mines, was approved by the Secretary of the Interior under the Department's general labor policy. This agreement provides a greater area for cooperation between labor and management in establishing wages and working conditions. Labor-management agreements in the Bureau of Reclamation have existed since 1950 and this year were expanded to include the California projects and power operation and maintenance units in the upper Missouri River and the North and South Platte River Basins.

Due to the necessity for streamlining personnel operations required for employing individuals throughout the Department on a part-time, seasonal, temporary, or intermittent basis, a short-term employment form was developed. This form consolidates all the information, affidavits, and procedures required to employ a person for a short term by the use of one document.

Several important administrative changes were made in the conduct of the fourth departmental management training program which began in September 1952. It was decided to decentralize selection, placement, supervision, and counseling of the trainees to the bureaus. Twenty-seven experienced employees were selected for training and 18 junior management assistants were recruited through the Civil Service Commission for the 1953 program. In addition to the departmental management training program, four of the bureaus conducted management selection and training activities in the field.

The Division also worked closely with the Senate and House Committees on Post Office and Civil Service in the preparation of reports encompassing all phases of personnel administration and manpower utilization in the Department of the Interior.

At the close of the fiscal year there were 58,727 compensated employees in the Department, of which 5,684 were in the Washington, D. C., metropolitan area, and the remainder located in the field. Of the total number 39,043 were classified by grade under the Classification Act, 16,120 under wage-board procedure, and 3,564 under other pay systems. Veterans in the Department now number 25,140. The number of women is 12,562.

There were 413 retirements in the Department during the year, of which 60 were for age, 227 were optional, and 126 were for disability.

DIVISION OF PROPERTY MANAGEMENT

N. O. Wood, Jr., Director

For the third full year of its operation, the Division can report considerable progress. During the fiscal year 1953, the effects of the equipment and materials priorities laws steadily declined. At the end of the fiscal year, the need for establishing priority requirements had ceased. One of the accomplishments of the year was the development and adoption by the bureaus of a simplified purchase procedure, which reduced costs in connection with small purchases and payments to vendors. The Division cooperated with GSA representatives in reviewing the requirements of the various offices and projects for working inventories. Information was developed which permitted field offices to reduce inventory levels by as much as 30 percent without detriment to operations. Arrangements were made with regional offices of the Federal Supply Service to carry the entire inventory, outside of construction stocks, for several large projects of the Department.

The Division instituted a weekly review of all substantial procurement transactions in February of 1953. As a result of this examination, it was determined where common-use items could be pooled and the need for additional purchases was obviated by arranging for transfers between bureaus.

The Division arranged meetings for technical personnel of motor vehicle manufacturers to discuss maintenance and operation of equipment with representatives of bureaus and other departments and agencies, and continued its activity of developing an expanded series of interdepartmental motor equipment field conferences.

The Manual of Allowances for Quarters, Subsistence, and Services was revised to include a basis for evaluating these items when provided by bureaus in the Territories. Secretarial authority was delegated to the bureaus to transfer, donate, or dispose of excess or surplus real property and to obtain excess property from other agencies for use in the Territories; approval was given to manuals of property accounting procedure developed by the Bureaus of Mines, Land Management, and Reclamation; and to a property accounting procedure to be used by bureaus engaged in overseas technical assistance programs. The Division obtained specific exemptions from GSA regulations where they were found to be unduly restrictive on the operations of the Department.

Inactive records disposition continued to be an important factor in achieving economy in utilization of office space and filing equipment. The Division continued to assist the bureaus in preparing records control schedules to insure prompt disposition of inactive records. Transfers to Federal Records Centers in 1953 released approximately 8,000 four-drawer filing cabinets for current use. A representative of the Division served on an interdepartmental committee to develop Civil Service Commission standards for use in a new position classification series, the Records-Management Series.

During the year, 281 radio-frequency assignments were made to provide for essential communications required by field activities of the Department. The assignments, authorized through the Interdepartment Radio Advisory Committee, involved 647 location and 580 frequency entries. The number of radio stations in the Department (excluding land-mobile and portable) now totals approximately 6,000, employing about 300 different radio frequencies between 200 kilocycles and 10,000 megacycles.

DIVISION OF SECURITY

J. Cordell Moore, Director

During the fiscal year 1953, the Division of Security was organized in the office of the Administrative Assistant Secretary. The functions of the security officer of the Department were assigned to the newly created Division and, in addition, matters relating to civil defense and facilities protection, were placed under its cognizance.

Although the Division of Security was in operation only 8 months of the fiscal year, considerable progress was made both in the field of physical and personnel security. In the fourth quarter of the fiscal year Executive Order 10450 was promulgated which provides for entirely new procedures with respect to personnel security within the Federal service. Steps are being taken to revise departmental security policies and procedures to conform to the new security regulations and new regulations have been drafted for use by the Department.

OFFICE OF THE SOLICITOR

Clarence A. Davis, Solicitor

GENERAL

The present Solicitor has occupied the position during only the last 4 months of the fiscal year ending June 30, 1953.

Records indicate, however, that the volume of work devolving upon the Solicitor's Office has been steadily increasing for some years. Whereas there were pending 391 undisposed-of matters at the end of the fiscal year 1952, there were pending 751 such matters at the end of the fiscal year 1953, the principal increases being in appeals on tort and contract claims and in appeals with reference to public-land matters. Some idea of the volume of work handled by the Solicitor's Office may be given by pointing out that during the year the Office reviewed 4,846 legal documents of various kinds. A survey of the more important matters handled in the various divisions of the Solicitor's Office follows:

DIVISION OF CLAIMS AND DEFENSE

Administration

Codification of delegations of authority.—The Claims Division has acted as coordinator of a joint project of the Office of the Administrative Assistant Secretary and the Office of the Solicitor to incorporate into a single general regulation the various delegations of authority from the Secretary of the Interior to officials throughout the Department. A preliminary draft of the codification was issued on January 16, 1953, in the form of a handbook of secretarial delegations. When issued in final form, the handbook will constitute the official source for all secretarial delegations of authority.

Contracts

Claims.—At the beginning of the fiscal year 10 contract appeals were pending in the Claims Division. As of June 30, 1953, 33 cases were pending. During the year prior to June 30, 1953, final action was taken on 27 appeals.

The more important matters in this category are as follows:

Donovan-James-Wismer & Becker (*CA–159*).—A provision in a contract authorizing the Government to suspend work under the contract, and providing for the allowance of the contractor's necessary expenses due to delay caused by such a suspension, relates only to the issuance of a directive by the Government suspending the work, and does not cover delay due to the alleged failure of the Government to fulfill its obligations under the contract.

Associated Piping and Engineering Company, Inc. (*CA–168*).—The requirement under a standard form of Government contract that a contractor file timely written notice with the contracting officer respecting a delay, and its cause, is not satisfied by a showing that a Government officer or employee had actual knowledge of a contractor's delay, and its cause.

Sacramento Electric Works (*CA–177*).—Where the completion of a contract was delayed by a period of time spent by the contracting officer in determining whether to approve substitute materials under a provision in the specifications of the contract permitting under certain circumstances the use of substitute material, with governmental approval, liquidated damages should not be assessed against the contractor for such delay.

Rodarmel Plumbing Company (*CA–182*).—Officials of this Department do not have authority to waive the imposition of liquidated damages on equitable grounds or on the asserted ground that the Government actually did not suffer any loss by reason of the delay in completing a particular contract.

Patents

During the year prior to June 30, some 20 opinions concerning patent matters were prepared in the Claims Division.

Tort and Irrigation Claims

The more important matters in this category are as follows:

A. Floyd and Mary Alice Yauger (*T–482* (*Ir.*)).—When damage to claimants' buildings resulted directly from seepage of a reservoir by the Bureau of Reclamation, and the owners relocated their buildings, an award was granted covering the cost of relocation and possible severance damage, not exceeding the decrease in the market value of the buildings.

Earl L. Crane (T–483).—A claim based upon financial loss, allegedly suffered by the claimant's unsuccessful attempt to produce certain crops on his land compatible with an erroneous classification made by personnel of the Bureau of Reclamation was rejected on the ground that the provision of the Interior Department Appropriation Act, 1953, permitting the payment of property claims, relates only to situations where property has been lost or physically harmed by the activities of the Bureau.

Personnel and Fiscal

Disciplinary matters.—As of June 30, 1953, 20 cases involving investigations of alleged misconduct on the part of employees of the Department had been reviewed in the Claims Division during the fiscal year. The alleged misconduct included violations of departmental regulations, misappropriation of Federal funds, supplies, and other property, misuse of Government motor vehicles, and irregularities in the disposal of Indian lands, timber, and other property.

Defense Activities

The services of the office were required in connection with a variety of matters pertaining to the responsibilities of the Secretary of the Interior relating to the Defense Production Act of 1950, section 124A of the Internal Revenue Code, industrial mobilization and postattack rehabilitation. Some of the more important matters that were considered dealt with stockpiling, advisory committees, legislation, proposed orders, and proposed action in the Department in the event of an attack.

DIVISION OF PUBLIC LANDS

The major work of the Public Lands Division during the 1952–53 fiscal year continued to be the preparation of decisions on appeals taken to the Secretary of the Interior from decisions by the Bureau of Land Management with respect to public-land matters. Among the more important decisions were the following:

Antonio DiRocco, et al., A–26434 (July 11, 1952), which held that persons other than actual applicants for oil and gas leases will be considered as the real parties in interest in the applications and will be subject to the acreage limitations applicable to lease applicants if they exercise substantial control over such applications and the leases to be issued and will receive the major benefits to be derived under such leases.

Union Oil Company of California, A–26518 (January 19, 1953), which refused to overturn a long-established practice of the Department whereby a mineral locator on land which has been patented subject to a reservation of the minerals can reconvey title to the surface to the United States and receive a mineral patent for the land.

William C. Holmes, A–26796 (May 27, 1953), which held that the Alaskan courts have exclusive jurisdiction to adjudicate protests based upon an asserted superior right of possession against allowance of claims to Alaska public lands for 5-acre homesites.

Percy Field Jebson, et al. v. *Emmet F. Spencer*, A–26596 (June 11, 1953), which held that land included in an oil and gas permit becomes subject to location under the mining laws immediately upon the expiration of the permit and without awaiting the notation of the cancellation of the permit on the land-office records, if the land at that time is not known to be valuable for any mineral subject to disposition under the Mineral Leasing Act.

Solicitor's opinions were also prepared by the Public Lands Division on a number of questions. Perhaps the most important of these was an opinion (M–36153, December 31, 1952) construing an exemption provision of the Federal Coal Mine Safety Act. The opinion held that the exemption in the act, of mines regularly employing 14 or fewer employees underground, does not apply to mines regularly employing more than 14 employees underground on a multiple-shift basis or alternate-week schedule, despite the fact that the number of individuals actually at work on any shift or during any week does not exceed 14.

An opinion (M–36159, December 30, 1952) was also rendered on several questions relating to the extension of oil and gas leases in certain situations involving commitment to unit agreements, assignments and drilling.

The Public Lands Division participated in a number of special matters of considerable importance and interest:

Katalla-Yakataga development contract.—This matter concerned attempts made to secure the issuance of some 400 oil and gas leases covering approximately 1 million acres of land in the Katalla-Yakataga area in Alaska and to secure the development of this area without conflicting with the acreage limitation provisions of the Mineral Leasing Act. A procedure was suggested to the proponents of the project for accomplishing this end, and it eventuated in the execution of a development contract whereby the Phillips Petroleum Co. has obligated itself to the United States to undertake a systematic and extensive program for exploration and development of the area at a very substantial cost.

President's Materials Policy Commission report.—The Chief of the Division participated as a member of a departmental steering committee in the preparation of a report setting forth the views and recommendations of this Department on the Paley Commission report. He also headed a task group charged with formulating the recommendations of the Department with respect to the portions of the Paley Commission report dealing with the mining and mineral leasing laws.

Outer Continental Shelf legislation.—Substantial time was spent in reviewing and recommending amendments to Senate bill 1901, a bill to provide for the administration of the lands of the outer Continental Shelf, which, in effect, passed the Senate as House bill 5134. This work included participating in hearings on the legislation, the drafting of amendments and revisions, and the consideration of certain legal questions arising in connection with the legislation.

Uranium mining claims.—Considerable attention was given to the problems arising from the location of mining claims for fissionable materials in Colorado and Utah on lands already included in oil and gas leases issued under the Mineral Leasing Act. Proposed legislation on the subject was discussed with representatives of the mining interests and the oil and gas interests, and reports on the pending legislation, together with a suggested bill, were prepared and submitted to the Congress.

INDIAN DIVISION

In addition to the handling of some 27 appeals, this Division was confronted with momentous litigation:

Arizona v. *California*, *et al.*, Original No. 10, in the Supreme Court of the United States, which is an action by the State of Arizona to quiet title to the use of certain waters of the Colorado River system in the lower Colorado River Basin, as against the claims of the defendants. The rights of the parties appear to be controlled largely by the Colorado River Compact of 1922, the Boulder Canyon Project Act, and the California Limitation Act. Because of large interests, the United States has intervened in the proceedings, since the water rights of the Indians of several Indian reservations within the lower Colorado River Basin area may be affected. Proposals to protect the Indian water rights from the litigation by a stipulation are now pending.

Texas v. *New Mexico*, *et al.*, Original No. 9, in the Supreme Court of the United States. In this case the State of Texas seeks to invoke the original jurisdiction of the United States Supreme Court to require the State of New Mexico to abide by the Rio Grande Compact of 1938 with reference to the storage and release of water impounded in New

Mexico. A master has been appointed. The matter is now pending before the master on the question of the indispensability of the United States to the litigation. The water rights of various Indian Pueblos might be affected adversely, dependent upon the termination of the litigation, and the question of the advisability of the intervention of the United States is pending before this Department and the Department of Justice.

Much time during the year has been devoted to criminal and civil actions with respect to a series of fraudulent transactions involving valuable Indian timberland in Oregon, in which two field employees of the Indian Bureau were participants. A successful criminal prosecution of the three principals followed, as did remedial civil litigation and administrative action to restore the *status quo ante.*

Advisory opinions and decisions in appeals cases.—A number of advisory opinions and decisions in appeals cases involving important principles of Indian law were prepared in the Division during the year. Among these are the following:

A–26615, A–22558, A–22586, A–26616 (*January 15, 1953*).—In these proceedings it was held that the Secretary of the Interior was authorized to fix the value of oil produced from Indian leases on the basis of the highest price offered or paid for the major portion of like quality oil produced and sold from the particular field in which the leased lands were located, irrespective of the fact that only one of the companies purchasing oil in that field bought the oil. It was further held that where there was only one purchaser of oil in a particular field, the posted price paid by that purchaser for the oil was acceptable since the price paid was the highest posted price for all of the oil produced and sold from the field.

M–36162 (*April 2, 1953*).—In this opinion the Solicitor ruled that the Federal supervision over Indian reservation lands could not be transferred to a State without enabling legislation by the Congress.

M–36148 (*October 27, 1952*).—It was held in this opinion that Indian tribal lands needed for the Yellowtail Dam and Reservoir site could not be acquired by the United States in condemnation proceedings without additional legislation by the Congress.

M–36155 (*November 21, 1952*).—It was held in this opinion that the provisions of section 16 of the Indian Reorganization Act, respecting the exercise by the Secretary of the Interior of the authority conferred on him to approve for organized Indian tribes "the choice of counsel and the fixing of fees" is mandatory, and that, therefore, a tribe subject to this provision may not adopt an amendment to its constitution under which it could employ attorneys for certain purposes without securing the approval by the Secretary of the choice of attorneys and the fixing of fees.

IA–96 (*April 20, 1953*).—In this proceeding it was held that a will devising in trust, for charitable purposes, the restricted estate of an Indian testator to an Indian tribe not organized under the Indian Reorganization Act, is valid.

LEGISLATION

The fiscal year 1953 included the final portion of the second session of the 82d Congress and the initial portion of the first session of the 83d Congress. The following statutes of major importance to the Department of the Interior were enacted during the fiscal year:

Public Law 447 (July 3, 1952, 66 Stat. 327) created the Commonwealth of Puerto Rico by congressional sanction to the constitution adopted by the people of Puerto Rico. To a substantial extent this vests self-government in the Commonwealth.

Public Law 31, the Submerged Lands Act (May 22, 1953, 67 Stat. 29), conveys to the States the lands beneath navigable waters within the historic boundaries of the States and in the natural resources of those lands and waters. The bill does not define the historic boundaries of the States, and the uncertainties of the phrase "historic boundaries" continue.

Authorization for the Secretary of the Interior to initiate a program of research and development for the utilization of saline waters was granted by Public Law 448, approved July 3, 1952 (66 Stat. 328). This program has as its objective the discovery and perfection of methods for recovering fresh water from the ocean and other bodies of salt water, at costs sufficiently low to make possible the large-scale utilization of such reclaimed water in agriculture, industry, and other pursuits.

Public Law 552, approved July 16, 1952 (66 Stat. 692), extended materially the scope of Federal authority in the mine safety field. This act establishes a detailed system of safety regulation for coal mines, and places the responsibility for its administration in the Bureau of Mines.

Public Law 569, approved July 16, 1952 (66 Stat. 736), implements State fishery laws by prohibiting the transportation in interstate commerce of fish caught in violation of State laws. It amends an earlier statute which imposed a like prohibition with respect to game fish only. The responsibility for enforcement of this legislation rests with the Secretary of the Interior.

Public Law 529, entitled the "Halogeton Glomeratus Control Act", approved July 14, 1952 (66 Stat. 597), is directed to the end of eradicating a stock-killing weed that in recent years has spread widely among the grazing lands of the West.

The process of transferring the responsibility for the education of Indian children from the Federal Government to the States will be facilitated by Public Law 47, approved June 4, 1953 (67 Stat. 41). This measure will permit the transfer, without reimbursement, of school properties administered by the Bureau of Indian Affairs to the States, or their political subdivisions, for use as part of the local school systems. It contains provisions designed to insure that properties so transferred will be made available for the education of Indian children on the same terms as for non-Indian pupils. The act thus recognizes that it is highly desirable for Indian children to attend public schools in order that they may obtain the benefits of association with non-Indians.

Public Laws 48 and 49, approved June 4, 1953 (67 Stat. 42), permit homestead allotments on the Blackfeet and Crow Indian Reservations to be disposed of in the same manner as other Indian lands, thereby eliminating numerous private bills heretofore designed to provide exceptions for individual cases.

Public Law 95, entitled the "Defense Production Act Amendments of 1953", approved June 30, 1953 (67 Stat. 129), continues in effect until June 30, 1955, most of the provisions of titles I, III, and VII of the Defense Production Act of 1950. These titles contain the greater part of the basic authority under which the defense activities of the Department of the Interior are conducted.

COURT DECISIONS AFFECTING THE DEPARTMENT

There have been several decisions during the year which have had and will have a wide effect upon the activities of the Department.

In the *Roanoke Rapids* case (*U. S.* v. *F. P. C. and Virginia Electric and Power Co.*, 345 U. S. 153), the Supreme Court of the United States affirmed the Federal Power Commission's grant of a license to Virginia Electric and Power Co. to develop the hydroelectric plant at Roanoke Rapids on the Roanoke River, against the contention of this Department that the project had been reserved for governmental development. While holding that the Secretary had sufficient standing to intervene in the proceedings, the court refused to upset the determination of the Power Commission as to which of the contending parties should be granted the license. The case tends to negative the right of the Department to oppose other applicants for hydroelectric sites in cases where the Government has not been authorized by Congress to construct the project.

Oscar L. Chapman, Secretary of the Interior v. *El Paso Natural Gas Co., et al.* (204 F. 2d 46). In this case the Court of Appeals for the District of Columbia held that certain regulations promulgated by the Secretary to implement the clause of the Mineral Leasing Act which requires natural gas pipelines to be common carriers, were beyond the power of the Secretary, and the Secretary was directed to issue the right-of-way permits involved in that case without the restrictions sought to be imposed. The decision has resulted in passage by the Congress of legislation, which for all practical purposes, eliminates the common carrier provision as to natural gas pipelines.

In a case involving the Ivanhoe Irrigation District (Superior Court, Tulare County, California, No. 39627), the court to which this contract was submitted has refused to confirm the validity of the repayment contract negotiated by the Bureau of Reclamation, despite the fact that several other California courts have validated similar contracts in uncontested proceedings. The matter in controversy is primarily over the excess lands provision and the failure to vest water rights. In the absence of legislative action, protracted litigation over the validity of this type of contract is in prospect.

In *Kansas City Power & Light Company*, *et al.* v. *McKay* (*substituted*), *et al.* (D. C. unreported), the District Court of the District of Columbia held valid numerous complicated contracts between the Southwestern Power Administration and various cooperatives in Arkansas and Missouri. However, the decision has been largely nullified by congressional action, because the Congress has clearly expressed its intention that no funds are to be used to carry the contracts forward.

REORGANIZATION

Serious consideration is being given to a complete reorganization of the legal staff of the entire Department, looking toward consolidation of all legal work under the direction of the Solicitor and the designation of all lawyers as under the control of the Solicitor, rather than as attorneys for particular bureaus. It is felt that opinions of the Department will be more uniform, the activity and opportunity of the individual lawyer will be enlarged, overspecialization in a particular bureau will be eliminated, and the lawyers will be in a position to render more disinterested advice, if they are responsible solely to the Solicitor.

BUREAU OF INDIAN AFFAIRS

W. Barton Greenwood, Acting Commissioner[1]

"Federal responsibility for administering the affairs of individual Indian tribes," the Assistant Secretary for Public Land Management wrote to the chairman of the Indian Affairs Subcommittee of the Senate on March 13, 1953, "should be terminated as rapidly as the circumstances of each tribe will permit. This should be accomplished by arrangements with the proper public bodies of the political subdivisions to assume responsibility for the services customarily enjoyed by the non-Indian residents of such political subdivisions and by distribution of tribal assets to the tribes as a unit or by division of the tribal assets among the individual members, whichever may appear to be the better plan in each case. In addition, responsibility for trust properties should be transferred to the Indians themselves, either as groups or individuals as soon as feasible."

Although this statement was made comparatively late in the fiscal year, it reflected the policy which was followed earlier and thus serves as an effective keynote for Indian Bureau activities throughout the entire period.

In the field of programing for termination of Federal responsibilities significant progress was made during the year with a large number of widely scattered Indian groups. Proposed legislation to facilitate Indian Bureau withdrawal from California and from the Grand Ronde-Siletz area of western Oregon, introduced in Congress but not enacted the previous year, was reviewed and prepared for resubmission. Similar legislation was also being prepared for four additional groups of Indians expressing an interest in being relieved of Federal supervision. These were the Klamaths of Oregon, the Alabama-Coushattas of Texas, the Chitamachas of Louisiana, and the Prairie Island Band of Minnesota. Programing of a more preliminary nature was carried forward with the Osages of Oklahoma, the

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[1] Mr. Dillon S. Myer was Commissioner of Indian Affairs until March 20, 1953. Mr. Greenwood was Acting Commissioner throughout the remainder of the fiscal year.

Menominees of Wisconsin, the Colvilles and Spokanes of Washington, the Flatheads of Montana, and a large number of smaller groups throughout the Western States.

Transfer of service responsibilities to State and local agencies continued at an accelerating tempo. One of the Bureau's hospitals—at Hayward, Wis.—was transferred to a locally organized group for future management while three others—Uintah-Ouray in Utah, Fort Totten in North Dakota, and Wind River in Wyoming—were closed after arrangements had been made to care for eligible Indian patients in other nearby facilities. This brought the total number of Bureau hospitals in the United States and Alaska down to 59. In the field of education responsibility for academic instruction at 3 of the Bureau's boarding schools and full-management responsibility for 16 of the day schools were transferred to local public-school authorities. The combined enrollment involved in these transfers amounted to approximately 1,100 Indian children. The Bureau also narrowed its responsibilities for maintenance of roads on Indian reservations by transferring a total of 75 miles to the counties and carrying out improvements which should make possible the transfer of 400 additional miles in the near future. Indian borrowing from non-Bureau sources continued at a high rate with an estimated volume of more than $22 million of credit obtained by the Indians from such sources in fiscal 1952 compared with $2,463,835 of additional loans made by the Bureau in the same period.

Trust supervision over Indian land continued to be one of the Bureau's heaviest responsibilities. Income to the Indians from mineral leases, principally oil and gas, on their lands increased from $18,600,000 in fiscal 1952 to more than $23 million in 1953. The number of leases approved in 1953 was more than 2,300 or more than double the number for the previous year. A similarly heavy workload was carried by most Bureau field offices in connection with other types of land transactions. Some progress was made by the Bureau, however, in divesting itself of trust responsibilities for allotted Indian lands. Issuance of patents in fee nearly doubled as compared with the previous year—increasing from 333 tracts to 623—while the disposition of allotted holdings through advertised sale more than tripled, rising from 496 tracts in 1952 to 1,721 in 1953. Altogether more than 2,500 tracts were removed from trust or restricted status.

The most striking progress toward complete Bureau withdrawal was achieved in California. Despite the lack of basic facilitating legislation, which will be needed before the process can be completed, the Bureau made significant strides under the provisions of existing law in narrowing the scope of its California operations and responsibilities. The welfare program was closed out at the end of fiscal 1952 with State and county agencies assuming the entire burden of welfare aid to California Indians in 1953. Litigation brought by one of the California counties resulted in a decision that Indians are entitled to welfare assistance from the counties on the same basis as other citizens. In addition, the Bureau closed out 550 individual Indian money accounts, leaving approximately 2,000 accounts still active; initiated a complete inventory of the Federal buildings used in the administration of California Indian affairs; sold 102 public-domain Indian allotments and 27 reservation allotments for a total return to the Indian owners of approximately $1 million; completed appraisal work, looking toward disposition, on 260 additional public-domain allotments, 171 of them timbered. It also carried out boundary surveys on 29 reservations or rancherias; reached agreements with county highway departments under which more than 190 miles of Bureau roads will be transferred to the counties for maintenance after they have been improved to county standards. Also, it curtailed the enrollment at Bureau boarding schools throughout the country by prohibiting additional enrollment of California Indian children; negotiated a public-health contract with Mendocino County, which eliminated the need for a Bureau public-health nurse serving the area, and a medical-care contract with Modoc County, which eliminated the need for further Bureau financing of the part-time services of a local doctor. During the year the Bureau's extension agent for California spent all of his time liquidating Indian debts to the United States. At the close of the year the position was abolished and responsibility for further collections on the remaining debts was transferred to the Phoenix area office. The Hoopa Indians indicated an active interest in taking over responsibility for management of the Bureau's hospital on their reservation and good progress was made in negotiations looking toward that objective.

The long-range rehabilitation program for the Navajos and Hopis, authorized by Public Law 474 of the 81st Congress, moved into its third full year of operations and produced additional basic improvements for the benefit of the two tribal groups. Educational facilities on the reservation were expanded through the establishment of five trailer schools and the completion of three school construction projects. Simultaneously enrollment of Navajo children in schools of all types reached an all-time high at 14,106, an increase of almost 1,000 over the previous fiscal year. Road-construction work advanced materially with the completion of 53.5 miles of grade construction, 37 miles of base or gravel surfacing, 15.6 miles of bituminous surfacing, and 433 linear feet of bridges. A community center at Gallup, N. Mex., to provide overnight accommodations for Indians in transit between the reservation and seasonal jobs, was completed and arrangements were made for its operation by a nongovernmental agency. Work was completed on 48 deep-pit charcos of the type which have proved highly successful in conserving soil and water on the rangelands of the Navajo Reservation. Nine additional wells were drilled with long-range funds. In the field of tribal business enterprises the chief accomplishment of the year was the completion of a basic agreement between the Navajo Tribe and the Bureau of Indian Affairs under which the tribe will assume the major share of operating responsibilities. Enterprises actually established in 1953 included two tribal motels and a number of smaller business projects of various types.

PROGRAM DEVELOPMENT

The Bureau's Division of Program, established in fiscal 1952, continued to pursue two main tasks. First, it concentrated upon fact gathering and analysis to form the basis for amplifying and further developing program policy and procedure. Secondly, it expanded its direct-contact efforts to encompass an increasing number of Indian groups. Staff members of the Division continued in the approach of studying individual reservation situations, extending their attention beyond those situations where Bureau withdrawal seemed like an early prospect to include some Indian groups thought to require intermediate and longer periods before they assume complete responsibility for the management of their affairs.

Building upon the experience gained in the study of individual reservation situations and bringing together the thinking and experience of other central office and field staff at the areas studied, the Division staff developed plans for a nationwide survey of the circumstances of each tribe, band, or group of Indians coming within the purview of Bureau responsibilities. An inventory checklist in four parts was devised for this undertaking. The first part was designed to compile facts bearing upon basic factors such as the following: Population, resources, income, dependency status, business and governmental organization, nature and scope of Bureau services rendered, potential realty tax revenue, treaty rights, and pending claims against the United States. This part ended with a request of local administrators for an appraisal of the qualifications of the particular Indian group to manage its affairs independently of the Bureau. The second part of the inventory checklist was designed to indicate the pace of progress of the particular Indian group toward independence of need for special Federal supervision. The third part was designed to delineate the major problems and tasks impeding the Indian's progress toward the basic objective. The fourth part of the inventory checklist requested a listing of Indian groups considered presently able to manage their own affairs without further supervision of the Federal Government.

Subsequently, the inventory checklist was transmitted to the field and the inventory completed by engaging the active participation of Bureau staff and in many cases tribal leaders at all field installations. In all, some 200 different tribes, bands, and groups of Indians were covered in the survey. Besides serving the purpose of obtaining data for analyses necessary to develop policy and procedures to govern programing toward withdrawal throughout the Bureau, the comprehensive survey now constitutes a source of basic information and a ready reference to progress toward Bureau withdrawal up to August 1952, when the survey was made. The survey also helped to acquaint both Bureau field personnel and Indian leaders with the nature of the problems and tasks involved in each situation so that they may better proceed toward mutual objectives culminating in Bureau withdrawal.

While progress was being made in the development of programing policy, both in Congress and within the Department and Bureau, the Bureau continued to work with Indian groups to facilitate the development and institution of specific programs appropriate to their circumstances and stage of readiness to proceed independently of special Federal supervision and assistance. In the annual report for fiscal year 1952, a number of Indian groups with whom the Bureau initiated programing efforts were mentioned. The Bureau's staff, both central office and field, continued to work with these Indians during fiscal year 1953, and also began programing activities with others.

Among the Indian groups listed in the last annual report were the California, Grand-Ronde Siletz, and Klamath Indian groups. Proposed withdrawal legislation covering the first two groups was introduced in the 82d Congress but not enacted. Similar bills for all three groups were in process of drafting at the close of fiscal 1953. Three other Indian groups indicated their interest in developing a terminal program during fiscal 1953: the Chitimacha Band of Louisiana, the Coushatta Band in Texas, and the Prairie Island Band in Minnesota. The Bureau consulted with all three groups to determine the required measures and the necessary enabling legislation. The Coushatta Band is in a unique situation since the State of Texas has indicated willingness to have the Coushatta Reservation continued under State trusteeship.

A factual study of the existing circumstances of the Osage Tribe in Oklahoma was undertaken and completed during the year as a measure to clarify the important factors that should be considered in potential programing proposals. Bureau work with the Menominees of Wisconsin continued, and mutual understanding of the need for the Menominee Tribe to take positive steps in programing for its release from Federal supervision was reached toward the close of the year. In addition, the Colville and Spokane Indian groups in Washington, and the Flathead Indian group in Montana were approached by the Bureau to consider programing toward their release from Federal supervision. These three Indian groups, like the Osage and Menominee, have substantial tribal assets and will encounter similar programing problems.

The Bureau also took steps during the year to further program development leading to termination of Federal supervision for Indian groups in Michigan, Iowa, Kansas, northeastern Oklahoma, Nevada, Nebraska, western Washington, and the Flandreau community in South Dakota. Various preparatory measures were taken such as clearing up problems of land ownership, but in most cases involving these groups the Bureau's efforts are still in the preliminary stages of establishing a basis of understanding for specific program development.

Not all of the Bureau's programing efforts involved Indian groups which are at the point where termination of Federal trusteeship is in prospect within the reasonably near future. Significant progress was made during the year in longer range programing with the Ute Indian groups: the Uintah and Ourays of Utah and the Ute Mountain group and Southern Utes of Colorado. A rehabilitation program for the Papago Indians of Arizona was also under study.

Missouri River Basin Programing

Through a special staff at Billings, Mont., the Bureau has been helping Indian groups affected by Missouri River Basin development programs to protect their interests and to make maximum use of compensatory benefits realized in connection with the reservoir developments.

Activities of the Missouri River Basin Investigations staff include soil, range, forest, engineering, and socioeconomic surveys; assembly, analysis, and evaluation of factual materials; appraisal of properties and damages to properties; and formulation of practicable plans and programs relating to the development and use of resources and the solution of problems involving Indian resources and peoples.

By the end of fiscal 1953, 1 major job—the appraisal of Indian properties and the assessment of damages to Indians from land takings in 7 reservations for the Garrison, Oahe, and Fort Randall Dams—was nearly completed. Appraisal of 333,538 acres of Indian land and of improvements and commercial timber on these lands was completed. These appraisals furnished the principal basis for negotiations between the Indians and the United States Corps of Engineers in their efforts to arrive at a settlement price for properties.

During the year MRBI personnel also participated in numerous negotiation conferences affecting Standing Rock, Cheyenne River, Crow Creek, and Lower Brule Reservations. Agreement was reached on a settlement of $1,575,000 for Indian properties in the Standing Rock Reservation taking. Prospects for acceptance of MRBI values by the Indians of Crow Creek and Lower Brule, and the corps, appeared favorable at the end of June 1953. Conferences with the Cheyenne River Reservation Indians clarified the issues in question but agreement was not reached on the value of properties to be taken.

Comprehensive investigations to obtain basic data essential to reservationwide development programs are being undertaken on other Missouri Basin reservations. The Crow Reservation in Montana was selected for an intensive socioeconomic study during fiscal years 1953–54. More than 95 percent of the resident families have been visited, schedules taken, analyzed, and a draft report prepared. A proposed farm management survey, under the direction of Montana State College, will include Crow Indians engaged in livestock or crop production. This analysis will show the size of farm, combination of farm enterprises, and the relative profitableness of various farm organizations. Findings of these two surveys will be integrated with irrigation, soils, and other physical resources data to formulate a comprehensive program for the development of physical and human resources on the reservation.

LAND ACTIVITIES

The Indians of the United States, some 400,000 of them, own, control, or have use of about 56 million acres of land located in 26 States, under the trusteeship or supervision of the Federal Government. About 14,695,000 acres are owned by individuals and about 40 million acres are jointly owned by tribes, bands, or groups. About 1 million acres available for Indian use are federally owned. Of the total of 56 million acres, 540,000 are irrigated lands, 3,255,000 are dry farmlands, 49 million are classed as grazing and timberlands, and about 3 million are barren and wastelands.

Practically all of these lands share two distinguishing characteristics which set them apart. First, they may not be conveyed by the beneficial owners without the consent of the Congress if they are owned by tribes or other groups in common, or without the consent of the Secretary of the Interior or his authorized representative, if they are individually owned. Secondly, they are generally exempt from local and State taxation. Both of these attributes were imposed upon Indian lands for the protection of the Indians.

More than 3,000 laws relate directly or indirectly to the Indian lands, affect the status of the lands, and govern the manner in which they may be conveyed and by which the trust or restrictions may be removed. The laws also place upon the Secretary of the Interior a trusteeship responsibility for protection of the titles to the land, the leasing of the land, the sale of minerals, the granting of rights-of-way, and the sale of timber, while the lands are held in a trust status.

In line with the policy of transferring, as soon as feasible, to the Indians themselves, either as groups or individuals, the responsibility for management of their properties, the Bureau has continued, during the fiscal year 1953, to emphasize the development and use of procedures to facilitate the orderly withdrawal of Federal supervision over the trust or restricted lands.

The trusteeship of the Federal Government over individually owned Indian lands is extinguished chiefly by one of three methods: (1) the issuance of patents in fee covering lands owned by Indians who are determined to be competent to manage their own affairs, (2) advertised sales, with conveyance by patent in fee to the purchaser, or by deeds executed by the owners and approved by the Secretary or his authorized representative, or (3) removal of the restrictions which prevent conveyance of the land without the consent of the Secretary of the Interior, or his representative. The issuance of certificates of competency may also serve to remove the trusteeship of the Government over certain types of Indian lands.

Heirship Problem

Technical and legal difficulties confront the Bureau in carrying out the withdrawal of its supervision over the land. These difficulties have arisen primarily from the laws restricting the conveyance of the land and from the fractionated ownership of the lands which has come about through inheritance while the lands have been held in a trust or restricted status for as long as 40 to 60 years, or even longer in some cases. Through the process of inheritance the ownership of an allotment becomes subdivided on the death of the owner, and the division of ownership becomes greater with the death of successive heirs. By the time the allotment reaches the 3d or 4th generation the individual interest becomes so small that it may represent only a fraction of an acre. It is not uncommon to find 20 or 30 heirs owning interests in a single tract, or one person having interests in a dozen tracts scattered over the reservation. There are even a few cases where a hundred or more heirs have varying fractional interests in a single tract. It is not unusual for the Bureau to use a common denominator in the millions in determining the division of the proceeds from an agricultural lease, an oil and gas lease, or a sale.

The problem of maintaining accurate records becomes greater as the number of heirs increases, and more time is required for completion of a transaction. When the death of an allottee or heir has not been reported and the estate has not been probated, it is necessary to delay the transaction pending determination of ownership. Loss to the Indian may result because of the Bureau's inability to take advantage of markets when they are available. Prompt action on oil and gas leases and other transactions is essential in the Federal Government's discharge of its moral and legal obligation to the Indians whose lands are under Federal trusteeship.

As of June 30, 1952, only 43,537 of the 115,130 allotted tracts still held in Indian ownership were in the hands of the living original allottees. Of those in heirship status, 54,438 tracts were held by 2 to 5 heirs, and 23,462 tracts were held by 6 or more heirs.

Backlog of Land Work

Because of this multiple ownership problem, the job of the Bureau in the supervision of leasing for agricultural and industrial purposes, the sale of oil and gas and other mineral leases, the granting of rights-of-way, the preparation of data for probating the estates of deceased Indians, and the maintenance of records has becomes so great that it has been impossible to keep pace with Indian demands for assistance in consolidating their holdings into usable units or in disposing of their interests.

On June 30, 1952, field offices of the Bureau reported a backlog of work, exclusive of heirship determinations, amounting to approximately 14,180 land transactions of all types. These included 1,153 applications for patents in fee, and 3,443 requests for sale of land. Despite an intensive effort to reduce this backlog during fiscal 1953 and encouraging progress in certain areas, the number of pending cases bureauwide at the end of the year was comparable to that at the beginning.

Aside from the additional work created by the fractionated ownership of the lands through inheritance, there are a number of reasons for this situation. One has been the marked increase in oil and gas and other mineral leasing activity in a number of areas. Another has been the growing demand for rights-of-way occasioned, primarily by the expansion of electric distribution and power transmission lines across the reservations. A third has been the taking of land for dam and reservoirs, settlement therefor, and the acquisition of lieu lands for Indian families who were removed from the taking areas. Finally, the interest of non-Indians in purchasing Indian lands has continued to be very active because of high agricultural prices. As a result, there has been a large volume of requests from Indians for sales, patents in fee, and removal of restrictions, and for assistance in land adjustments and consolidation of interests, sale and purchases of additional tracts, acquisition of inherited interests in tracts by individuals owning part interests, and partitions and exchanges.

Policies of the Bureau in relation to Indian lands have varied in the past from the extreme of declaring all Indians of certain tribes of less than one-half degree of Indian blood as competent and eligible for fee title to the land to the other extreme of not permitting the disposition of any land. The Indian Reorganization Act of June 30, 1934, extended the trust period indefinitely for groups accepting the act. Sales of land on reservations subject to the provisions of the act were not permitted from 1934 to 1948, when the limitation was removed by act of Congress. The policy, from 1933 to 1950, was to encourage the Indians to retain their lands and a relatively small number of patents in fee and sales were authorized. During these years there was created an unsatisfied demand for patents and sales that has not yet been met.

Since one of the obstacles retarding progress in transferring to the Indians responsibility for their properties was the lack of sufficient manpower to complete the volume of land transactions and bring the land records up to date, personnel engaged in other work was detailed at a number of agencies to assist on land activities. Some progress was made at agencies where personnel were detailed long enough so that they became familiar with the procedures and techniques involved in the work. Generally, however, personnel could be spared from other work only intermittently, for short periods, and at the sacrifice of other programs. Consequently their effectiveness on the land work was sharply limited by their lack of experience.

Although it was not possible during fiscal year 1953 to meet the demands for land transactions, there was a considerable increase in the number of sales of land and patents in fee issued. Patents in fee were issued to Indians for a total of 623 tracts of land, as compared to 333 issued in 1952. Altogether 1,721 tracts of land were sold through advertised sale, as compared to 496 in 1952. Certificates of competency were issued to 32 Indians and restrictions were removed on 184 tracts. In all 2,527 tracts of land were removed from trust or restricted status during the fiscal year, or slightly more than 2 percent of the 115,130 tracts reported in such status on June 30, 1952.

In addition, there were about 1,000 transactions of various kinds that assisted in reducing the probate and record work of the Bureau. These included 697 sales between Indians, 97 conveyances without consideration between individuals who are close relatives, 193 conveyances to tribes, and 78 exchanges between individuals, between individuals and tribes, and between individuals and non-Indians. All of these transactions tended to reduce the ownership of a tract to a single individual or group. Thus, although the land remains in trust status, the number of probate determinations may be materially reduced and the record keeping and procedures for sale or patent in fee are simplified. These transactions generally are for the purpose of consolidating individual scattered holdings or acquiring land in economic farm and grazing units, a procedure which is necessary in an orderly withdrawal of Federal supervision.

Mineral Leasing

The income received by Indians in fiscal 1953 from oil and gas and other minerals reached an all-time high topping the previous year's figures by a substantial margin. Near the end of the fiscal year the income from leases, including sales, was approximately $23,650,000, made up of the following items:

Bonus bid for oil and gas leases	$13, 169, 837
Rental	1, 832, 910
Royalty	8, 649, 673

This compares with $18,600,000 mineral leasing income in fiscal 1952.

Approximately 2,358 oil and gas leases were approved covering nearly 485,000 acres. By comparison, in 1946 only 1,127 leases covering 127,886 acres were approved and the total income accruing to Indians from oil and gas that year amounted to $6,666,791. The increased income has resulted largely from bonuses and rentals paid on leases in the newer areas in Montana, the Dakotas, Utah, and New Mexico.

In the Rocky Mountain Region, the interest still centers on the Fort Peck Reservation, Mont., with 11 producing wells. The income to the Fort Peck Indians from sales, including sales advertised in June 1953, was $1,500,000. The first well was brought in on Fort Peck in 1951. The Uintah and Ouray Reservation, Utah, is one of the newer producing reservations. The first well was brought in on this reservation in 1949. Out of 8 wells drilled on the tribal land, 6 are producing. Although there was a slight slackening of interest during fiscal 1953, the income from oil and gas development on this reservation amounted to more than $2 million.

The returns from leases covering minerals other than oil and gas amounted to approximately $900,000. The income was received almost wholly from the royalty on asbestos, coal, sand and gravel, phosphate, lead and zinc, and vanadium and uranium mining leases.

HEALTH

Fiscal 1953 was a comparatively good year for Indian health. Improvements in health services provided by the Bureau during 1952 were consolidated and expanded. New programs, made possible by specific appropriations, were initiated. Morbidity and mortality rates for leading diseases and causes of death continued to decline.

According to provisional statistics the three leading causes of death among Indians in 1952 (the latest year for which such data are available) were tuberculosis, accidents, and deaths from ill-defined and unknown causes. The provisional rate for deaths from tuberculosis among Indians was approximately 105 per 100,000 population compared with a general United States rate of 16.1. The current Indian rate is lower than the final Indian rate for 1950, which was 121.1. The provisional Indian infant mortality rate during 1952 was 80.5 per 1,000 live births, compared with a rate of 28.6 for the total United States. For the period 1948–49 the final Indian rate was 91.7.

In line with the general emphasis on withdrawal objectives, the Bureau continued the policy of not operating any health facility where other similar facilities are available and can be utilized.

Achievements under programs initiated during 1952 included a continuation of training courses in sanitation for qualified young Indians. A total of 21 students have now completed the course, and 14 remain on duty at various reservations. This was also the first full year's operation of the Bureau's second school of practical nursing. There was an increased tempo in management improvement techniques in direct hospital operations. The year also brought completion of one additional contract with a State health department—in South Dakota—providing for a transfer of public health and preventive services furnished previously by the Bureau and a rather large expansion of services to Indians under contracts previously entered into with State and county health units.

Programs inaugurated in 1953 were made possible by specific appropriations. Health units were established to provide preventive public health services on the Navajo and Pima-Papago Reservations. Contractual arrangements were executed by which Navajo tuberculosis patients are now hospitalized in private, community, and other sanatoriums in five different States. During the last month of the year a contract was negotiated with the School of Public Health of the University of Pittsburgh to undertake a comprehensive survey of health problems in Alaska.

Medical and Hospital Care

On July 1, 1952, the Bureau was operating 62 hospitals with an authorized capacity of 2,935 beds. The 3 hospitals closed and 1 transferred during the year reduced the total authorized beds to 2,881. The beds were divided between 1,538 general, 1,268 tuberculosis, and 75 orthopedic. The average patient load during the calendar year 1952 was 2,425.7 inpatients per day, divided between 1,282.1 general, 1,075.7 tuberculosis, and 67.9 orthopedic. In terms of capacity at the beginning of the year this represented 82.6 patients for every 100 beds. Ratios by type of service were 79.4 for general beds, 85.1 for tuberculosis beds, and 90.5 for orthopedic beds.

Improvement in hospital organization, administration, and operations was the theme of the annual meeting in Washington of Central Office and area office health personnel. This was implemented in 5 of the 11 areas in joint surveys by the team approach. Each team is composed of a physician, a nurse, and a hospital administrator. Working closely with the area director and his staff, the group studies all phases of hospital operation and recommends procedures designed to render the best medical and hospital care to the eligible, indigent Indian within the limits of available funds and personnel.

Further loss of civil-service medical officers continued. In June 1952 the number of such medical officers on duty with the Bureau was 73; a year later it was down to 56. The decrease was compensated for by assignment of commissioned officers of the Public Health Service who are discharging their obligation covering from 17 to 24 months of service.

In addition to patients cared for in Bureau hospitals additional patients were cared for in private, community, and other hospitals. The average patient load during the year was 715.6 inpatients per day, divided between 469.8 tuberculosis, 154.1 psychiatric, and 91.7 all other patients. The total costs for such hospitalization for the year amounted to $2,370,000. Costs per patient per day were $9.91 for tuberculosis patients, $3.58 for psychiatric, and $15.06 for all other patients.

Public Health and Preventive Services

During the year a new Section of Public Health Services was established in the Bureau's Branch of Health charged with the responsibility of administering and developing a more comprehensive preventive medical-dental care program, incorporating special provisions directed toward more effective tuberculosis control, extension, and expansion of child oral health services, and improved environmental sanitation. A public-health-trained physician was appointed to direct the activities of this section effective in October 1952.

The ultimate objective of the section, in conformity with Bureau policy, is to transfer all responsibility for Indian public-health services to State and local governmental agencies whenever feasible and practical, and to develop direct services in areas where local governmental agencies are unable, at present, to provide these services, thus preparing the way for transfer of the responsibility at a future date. Considerable progress was made during the year toward this objective. Responsibility for the provision of public health services has been transferred to State and local health departments through a combined total of 34 contracts negotiated under the provisions of the Johnson-O'Malley Act in 15 States and the Territory of Alaska involving a total annual cost to the Bureau of $269,344. Moreover, many local health departments are now extending services to the reservation Indian without benefit of contract or financial subsidy.

In areas where local health services were either undeveloped or nonexistent, embracing approximately 48 percent of the total Indian population, the Bureau continued to provide direct public-health nurses stationed at strategic population centers on the reservations, and scheduled field clinics conducted by field and hospital staff physicians.

Nursing Service

Recruitment of nursing personnel, particularly professional nurses, continued to be a major problem. With the decentralization of the Civil Service Board of Examiners to the regions, a definite need and opportunity arose to orient the Bureau's area nursing consultants to a new role as members of area boards of expert examiners. While this activity necessarily increased the volume and scope of the area nursing personnel responsibilities, it also provided better opportunities to facilitate the recruitment and prompt employment of nursing personnel in all categories.

Tuberculosis Control

Case-finding activities of the three mobile X-ray units operated by the Bureau were continued. Approximately 25,000 examinations were made during the year by these units. In addition, mobile X-ray units operated by the States of New Mexico, North Dakota, and Oklahoma examined approximately 5,000 Indians. While it is known that other State health departments are including Indians with other members of the local communities in similar X-ray examinations no information is available on the number of Indians covered.

The program for BCG vaccination of newborn infants in Bureau hospitals continued. Reports from 34 of the Bureau hospitals indicate that out of 4,251 live births a total of 3,168, or 75 percent, were vaccinated. The remainder were divided approximately equally between babies for which vaccination was refused by the family, and ones of which vaccination was considered inadvisable because of prematurity, active tuberculosis in the family, or other similar reasons.

The cooperative project with New York Hospital-Cornell Medical Center for the treatment of tuberculosis patients with isoniazide which began in 1952 continued in 1953.

EDUCATION

The education program of the Bureau for fiscal 1953 was geared to the accomplishment of three basic objectives: (1) to provide educational opportunities for the 26,000 Indian children out of school, (2) to transfer responsibility for Indian education services to the public-schools system as rapidly as feasible, and (3) to provide a sound educational program for the 38,000 children who are in Federal schools so that they can compete educationally with non-Indians.

The "Out of School" Problem

A limited number of the children out of school are married, or physically or mentally unfit. The majority, however, are out of school because of the lack of adequate school facilities. This situation is especially acute on the Navajo Reservation in New Mexico and Arizona, where 13,000 children are not attending school.

Under authorization contained in the long-range program for the rehabilitation of the Navajo and Hopi Indians the provision of additional education facilities is being undertaken as rapidly as possible with appropriations provided for the purpose. Some existing day-school facilities on the reservation have not been used to capacity because of the sparsity of population which makes it impossible for all pupils to attend on a day basis. These facilities are being converted to boarding facilities by adding 1 or 2 modest dormitories and enrolling the children on a 5- or 7-day boarding basis. There were 286 children enrolled in three converted day schools during 1953. In addition, five trailer units were established on the reservation for use as temporary schools. These facilities were located in areas where water was available and there was a school population which could be accommodated in the units. A total of 117 children were cared for in this way.

Federal boarding schools in other areas were also utilized for the out-of-school children from the Navajo Reservation. Part of these children were enrolled in the regular programs of the boarding schools. A total of 4,157 were enrolled in a special 5-year program designed for children 12 to 18 years of age with little or no school experience and little or limited knowledge of English. An accelerated program is provided to make these pupils literate and to equip them with a vocational skill which will enable them to obtain employment. The third group of 5-year students, comprising about 240 boys and girls, completed their courses during 1953. All but four were reported to be employed upon completion of the course.

Transfer of Educational Responsibilties

Under the provisions of the Johnson-O'Malley Act the Bureau negotiates contracts with States and local districts for the education of Indian children in public schools. There were approximately 53,000 Indian children enrolled in public schools during 1953. Of this number 31,000 attended schools which received financial assistance from the Bureau under Johnson-O'Malley contracts. There were 15 such contracts with States, a contract with the Territory of Alaska, and contracts covering approximately 28 districts in 4 other States. A contract was negotiated with the State of New Mexico, for the first time, replacing the former contracts with individual districts in the State. The contract with the Territory of Alaska covered eight additional schools which had in previous years been operated by the Bureau of Indian Affairs.

During 1953 the Bureau operated 93 boarding schools and 234 day schools. The day-school number includes 13 teacher-aid schools which were opened in remote native villages in Alaska to provide a limited program for children who would not otherwise have any educational opportunity.

As in the past, the academic program in the Bureau schools followed the State courses of study as closely as possible. The programs were supplemented, where necessary, to include activities designed to assist the Indian children in adapting to the society which they must enter to obtain employment. In areas where the children do not speak English when they enter school, the curricula were adjusted to meet the needs of the pupils. Emphasis was placed on the acquisition of English and the development of habits, knowledge, and skills that will enable the pupils to take their places in a culture which varies greatly from their own.

WELFARE

In 1953 State and local public-welfare agencies, courts, and State institutions showed greater interest and assumed more responsibility for Indian welfare than at any previous time. Full acceptance of the Indian as a citizen of the State and county, entitled to the social services available to any citizen, was one of the major goals of the Bureau's welfare staff. Presentation of the Indian's problem by the welfare staff and collaboration with the State and county authorities in meeting it helped to bring about increased understanding and acceptance.

On June 30, 1953, the welfare program of the Bureau was terminated in the State of Florida, as it was in California 1 year earlier. Social-service programs for Indian children and families in Florida were assumed by local and State welfare agencies. Provision for any needed general assistance and for burials became the responsibility of the county agencies.

Two judicial decisions affecting the rights of Indians to receive assistance from their respective State or county agencies on the same basis as other State residents were handed down in February 1953. Regarding general assistance programs generally, the case of *Rosalie Acosta, et al.*, v. *County of San Diego, California, et al.*, is of interest as the decision clearly states that residence on an Indian reservation does not disqualify an Indian, otherwise eligible, for general assistance. Eligibility for public assistance under the State department of public welfare in accordance with the Social Security Act was dealt with in the case of the *State of Arizona, et al.*, v. *Oveta Culp Hobby, as Federal Security Administrator of the Federal Social Security Act*, in which it was held that Indians in Arizona residing on Indian reservations, who otherwise meet the qualifications, are eligible for public assistance. As the result of this decision, Indians now receive public assistance in every State on the same basis as other citizens.

During fiscal 1953 the general-assistance caseload averaged 6,665 persons monthly. Funds were sufficient to meet the minimum needs of the less privileged groups according to State departments of public welfare standards. It was necessary to provide assistance from Federal funds at only 25 agencies, with tribal funds used for this program at 15 additional agencies and with needs at the remaining agencies, if any, met through local county sources.

PLACEMENT AND RELOCATION

During the fiscal year, over 2,600 Indian workers were placed in employment of a permanent nature through the efforts of the Bureau's placement and relocation officers. Some of these were placed through direct contacts with employers and others through the facilities of public employment agencies. Of the total number, approximately 650 workers together with their dependents (a total of more than 1,300 people) were given financial assistance by the Bureau to move to the communities where employment had been secured. In addition, Bureau personnel participated in placing several thousand Indian workers in temporary and seasonal work, chiefly in railroad and agricultural employment. The great majority of these placements were made through the facilities of public employment agencies, and only a small number through direct contact with employers. The statistics given above, however, do not include placement of Indians—probably a substantial number—in which Bureau personnel had no part.

Employment opportunities were plentiful during most of the year, and it was possible to assure permanent employment to almost all able-bodied workers qualified for such employment and sincerely interested in settling away from the reservations. Lack of sufficient funds for transportation and temporary subsistence made it impossible, however, for some workers otherwise interested in relocation to take advantage of these opportunities. Chicago and Los Angeles, with their wide and diversified opportunities for employment, continued to be the main centers for relocation. Most of the Indian workers assisted to relocate made good records and several large employers in urban areas who hired Indians for the first time with some doubts are now convinced of their value and are willing to hire more.

Experience to date has indicated that securing employment is only part—and not usually the most difficult part—of the problem of relocation. Successful relocation has involved many other activities designed to assist Indians in adjusting to the new community. These have included assistance in securing housing, providing information regarding community facilities, liaison with appropriate social agencies, and community groups to assure acceptance of the Indians, and followup visits to see how the worker and his family have adjusted and to assist, if necessary, in resolving problems which have arisen. In these activities maximum use has been made of established community agencies and civic organizations. Relocatees have been referred to these established agencies to meet specific problems which have arisen and to develop their independence of the Bureau of Indian Affairs.

In Chicago and Milwaukee, Bureau personnel initiated the establishment of relocation committees to develop a feeling of local responsibility for facilitating the adjustment of incoming Indians. These committees are composed of volunteer citizens, some in private capacities and others representing various welfare agencies, religious groups, and other community organizations. Bureau personnel also participated in the establishment of a Twin City (Minneapolis and St. Paul) church committee on Indian work to work with Indians attempting to settle in these cities. In Chicago, the Bureau's Placement and Relocation Office assisted in the establishment of an American Indian club. This club, which operates with complete independence, has several hundred members, most of them Indians who relocated recently, and conducts regular social and recreational programs.

While it has not been possible or feasible for the Bureau to keep in touch with many of the Indians after relocation, the available evidence indicates that less than one-third of those given relocation aid have returned to the reservations. Most of these were undoubtedly people who found the adjustment to new working and living conditions in non-Indian communities more difficult than anticipated. This is considered a good record in view of the difficult adjustment which most Indians leaving the reservations are called upon to make.

The fact that most of the adult Indians on reservations are unskilled and have little industrial experience has been a major problem in securing appropriate permanent employment. It has been possible through the cooperation and good will of employers to place many of these unskilled Indian workers in trainee positions which enable them to learn on the job. If the demand for labor decreases, however, such trainee positions will become scarce. In that event other means must be found to provide the necessary prejob training.

Prospects for employment and relocation in the future are good. Acceptance of Indians in non-Indian communities both as workers and residents has been demonstrated. Interest in relocation has gathered momentum and it is anticipated that there will be more applicants for assistance to leave the reservation during fiscal 1954 year than there were in 1953.

LAW AND ORDER

In the field of law enforcement, the Bureau continued negotiations with various tribal groups and State authorities looking toward a transfer of jurisdictional responsibilities within Indian reservations to the several States. Bureau-sponsored bills were introduced in the 82d Congress providing for transfer of jurisdiction to the States of California, Minnesota, Nebraska, Oregon, Washington, and Wisconsin. Hearings were held in the 82d Congress on several of these bills but none were enacted. Consideration of the bills apparently began too late in the session. Similar bills were introduced in the 83d Congress for the States of California, Minnesota, Oregon, Wisconsin, and Nevada.

In those States where transfer of jurisdiction is not feasible at present, the Bureau continued its efforts to improve conditions by seeking more efficient operations by the tribes and by Bureau personnel. In fiscal 1953 more tribes than ever before showed an active interest in improving tribal law-enforcement facilities. With the help and encouragement of Bureau personnel, several tribes acted to adopt State statutes as tribal law and made contracts with county judges and county sheriffs to act as tribal judges and tribal law-enforcement officers to enforce tribal laws. Such arrangements should help the Indians in becoming accustomed to the laws of the State and the enforcement of those laws by non-Indians and should hasten the time when State jurisdiction, as such, can be extended. Other tribes, on whose reservations the departmental law and order regulations presently apply, acted to adopt tribal law and order codes and to establish tribal courts. This, in great measure, relieves the Bureau of responsibility for the maintenance of law and order and of the expenses involved.

Training schools were held in the various areas by Bureau personnel for the purpose of training Indian police employed by the tribes. A course in law enforcement for the benefit of tribal councilmen and tribal law-enforcement officers, including judges, was offered in conjunction with the Indian Bureau's summer school and was well received.

EXTENSION WORK

In another field of service—agricultural extension and home demonstration—the Bureau continued its efforts to assist the Indians through technical advice and practical suggestions in building constructive farm and home programs designed to give them a higher standard of living through greater and more efficient use of their own resources. The program included assistance in the fundamentals of farm management, soil conservation, crop production, animal husbandry, horticulture, home improvement, food conservation, nutrition, and clothing.

There were 169 Bureau extension employees on duty during the year located at 45 agencies serving 113 reservations and operating under 9 area offices. Eight additional reservations were served by State extension employees through cooperative agreements between the Bureau of Indian Affairs and the respective State extension services. The Bureau's extension personnel in calendar year 1952 made 58,397 farm and home visits, held 3,209 meetings with an attendance of 76,100, and conducted 2,300 farm tours and demonstrations with an attendance of 30,078. Some 100,000 Indians called on extension workers at their offices to obtain information.

Economic Accomplishments

Economically, the Indian people living on reservations have made marked progress in the last 20 years. In 1932 their gross cash income earned from their own livestock and agricultural operations was over $1,299,800. It increased to more than $54 million by the end of 1951 which was the peak income year. At the end of 1952 it had declined to $40,420,432. While the increase in prices for agricultural products during this period was an important factor in increasing the Indians' agricultural income, the adoption of improved practices by the Indians taught to them by extension workers played even a more important role. On many reservations there have been marked improvements in Indian livestock and increase in crop yields on Indian-operated land.

Because of the large rangeland interests of Indians, livestock management is an important phase of the extension program. Assistance to Indians on livestock project in 1952 included efforts to increase the numbers, improve the quality, perfect the marketing procedures, and improve the condition under which the stockmen are operating. Fear of a continued falling market, drought, high-priced feed, and other factors exerted pressure on many Indian stockmen to decrease their herds and in some cases to go out of business. The total number of Indians owning livestock in 1952 was 33,980 as compared with 41,424 in 1951. Cattle owned by Indians increased from 170,800 head in 1932 to a peak of 382,344 in 1946. Since then the number has gradually declined to 319,800 in 1952.

The keeping of dairy cows by Indian farmers is encouraged in diversified farming areas, not only to meet family food needs but also to provide a source of cash income. At the close of the year 6,199 families owned 31,684 dairy cows. Of this group 4,815 families owned less than 5 head, 1,201 families owned 6 to 20 head, and 183 families owned 21 to 75 head. Oklahoma Indians are the leading dairymen. They own 20,950 head while all other Indians own the remaining 8,734 head.

The total number of sheep and goats owned by Indians as of December 31, 1952, was 551,090 as compared to 548,500 in 1951, which represents a slight increase. The general trend, however, has been downward corresponding to the general downward trend of "sheep on farms" in the 11 Western States. The cause for a lack of interest in the sheep industry is the inability on the part of flock owners to obtain competent and dependable labor, high prices for feed and range, and unfavorable weather conditions in some areas. Many Indians have changed from sheep to cattle. The cattle can be cared for by cooperative livestock associations thus enabling the owners to go away to engage in wage work.

Cooperative Contracts with States

In 1952 contractual agreements with State extension services were in effect in the States of Oklahoma, Montana, New Mexico, and Washington providing for full-time services of 5 home economists at Five Tribes Agency, Oklahoma; 2 farm agents at Fort Peck Agency, Montana; and 1 farm agent at Yakima Agency, Washington, as well as for part-time services of 1 home economist at Fort Peck Agency; 1 at Blackfeet Agency, Montana; and 1 at Mescalero Agency, New Mexico.

The home extension program for adults—similar to the long-established work of the Department of Agriculture but adapted to the needs, abilities, and experiences of the Indians—registered significant achievements in 1952. The program included efforts to improve family living through educational projects in family economics, housing and home management, foods and nutrition, textiles and clothing, and family relations and child development. Home extension reports show that 656 homes were constructed or remodeled, that water systems were installed in 314 homes and electricity in 739, that 546 pieces of furniture were reupholstered or renovated and that 1,317 pieces of furniture were added to Indian homes.

In 1952 there were 16 field home extension agents on duty in Oklahoma, New Mexico, Arizona, Colorado, and Mississippi, and 1 field supervisor located in Washington, D. C. Three new positions were added during the year at Hopi, Consolidated Ute, and Jicarilla Agencies. One Oklahoma position was transferred to Mississippi Choctaw Agency.

A total of 277 groups with a membership of 8,773 met regularly and 198 groups were assisted with special interest activities. Home agents assisted 9,278 families with food and nutrition problems. All told, 1,314,671 quarts of fruits, vegetables, and meat were canned; 713,254 of the same were dried; 2,371,116 were stored, and 301,261 were frozen. Assistance was given to 5,689 families with clothing projects and 5,657 families with home-management problems.

4–H Extension Work

During 1952 there were 599 reservation 4–H Clubs having an enrollment of 3,580 boys and 5,884 girls. The estimated value of 4–H Club products was $186,000. In comparison with 1951, there was a slight increase in the number of clubs and total enrollment and a slight decrease in the value of the products.

CREDIT ACTIVITIES

Loans through the Bureau of Indian Affairs are confined, insofar as possible, to Indians who have no other sources of credit available. Through June 30, 1952, $11,550,768 was available for loans by the United States from the revolving credit fund. As repayments of principal and interest are made, they are credited to the fund and are available for further loans. The revolving feature enabled the United States to lend a total of $21,584,993 through June 30, 1952.

Of this amount, payments totaling $12,217,704 were due, of which $10,244,052 had been paid through June 30, 1952. Payments totaling $725,038 were in transit, extensions of repayment terms had been granted on $997,083, cancellations had been effected on $5,583, and $245,948 was delinquent. The cash balance in the fund was $1,345,546. The repayment record in percentages for 1952 year was as follows:

Percent of amount due:	
Paid or in transit	89.78
Extended	8.17
Cancelled	.04
Delinquent	2.01

A total of $583,480 interest had been collected on loans from the revolving fund through June 30, 1952, and payments totaling $64,763 were in transit. Borrowers were delinquent in interest payments totaling $8,557, and $729 had been cancelled.

Livestock loans repayable to the United States in kind were made to Indians and Indian organizations beginning in 1934. The animals loaned originated in drouth purchases which were made to afford relief to stricken growers. This program is being converted to a cash basis, and the proceeds are being deposited in the revolving fund in accordance with authorization contained in the act of May 24, 1950 (25 U. S. C. 443). Through June 30, 1952, a total of $552,142 had been deposited. Indians and Indian organizations were still indebted to the United States for 37,082 head of cattle.

In addition to funds and livestock borrowed from the United States, tribes were using $8,537,445 of tribal funds in their credit operations, including tribal enterprises, as of June 30, 1952.

With the funds borrowed from the United States, plus tribal funds used for credit purposes, Indian organizations had made loans totaling $40,911,060 through June 30, 1952. This was possible because repayments received on loans were used for further loans within the terms of each organization's loan agreement with the United States. The balances unpaid and the types of loans were as follows:

Loans to

	Enterprises	Cooperatives	Individuals	Total
Total loaned	$15,268,793	$1,309,013	$24,333,254	$40,911,060
Repaid	5,932,006	1,035,246	15,830,470	22,797,722
Canceled	8,902		82,366	91,268
Balance unpaid	9,327,885	273,767	8,420,418	18,022,070

The enterprises to which loans were made are operated for the benefit of all members of the particular tribe and include stores, tourist courts, salmon canneries, arts and crafts production and selling organizations and various other types of activities. The cooperative associations are organizations composed of only a part of the tribal membership.

The amount loaned to individuals was for the following purposes:

	Percent
Nonrecoverable items such as seed, feed, subsistence, etc	19.70
Machinery	18.42
Livestock	19.97
Permanent improvements	9.82
Land	3.77
Education	3.30
Other recoverable items	10.43
Refinancing	14.59
	100.00

Full-blood Indians received 60 percent of the total number of loans made to individuals and 50 percent of the total amount loaned. Indians of one-half degree of Indian blood or more received 28 percent of the total number and 32 percent of the total amount loaned. Indians of less than one-half degree of Indian blood received 12 percent of the total number and 18 percent of the total amount loaned.

SOIL CONSERVATION

Because of increased appropriations for soil and moisture conservation work, the Bureau was able in fiscal 1953 to initiate this program on 11 additional reservations and to intensify the operations at most of the 33 locations where it had been going on in previous years. Progress at the new locations during the first year was encouraging with many of the Indians showing a good understanding of the work and definite interest in controlling erosion and building up the productive capacity of their lands.

Special technical surveys were made on three reservations to provide pertinent and specific information for planning the future of these groups. On the Red Lake Reservation in Minnesota a soil survey and land classification was completed to furnish information on the agricultural lands and the agricultural possibilities. The information was important since the Red Lake Indians will shift their economic base with the approaching cessation of timber cutting. On the Lummi lands of Washington, soil surveys and land classifications showed the agricultural possibilities and productive values of the Indian holdings. Those scattered tracts were being prepared for advertisement and sale. A survey was started on the Klamath Reservation in Oregon to determine the future irrigation potentialities of the lands and their needs for irrigation water.

In addition to their regular duties, soil conservation personnel of the Bureau also helped in bringing land records up to date and in appraising Indian lands for sales and similar transactions. Moreover, the soil-conservation program was instrumental in making such values better understood and appreciated by the Indian owners. As a result returns from sales and exchanges of tracts or their rental have increased markedly—in some instances by as much as 100 percent.

During the year additional Indian lands were included in soil-conservation districts and the proportion of total Indian lands so included rose from 41.5 to 47 percent. Of the maximum Indian acreage that could have been included in such districts if all the State and local determinations had been favorable, however, only 23 percent was actually included. Indian land embraced within the districts increased 16.5 percent as compared with 1952. The acreage and number of agreements on which there was active cooperation also increased materially.

The value of soil and moisture conservation work to Indian lands is steadily increasing. During the past 5 years the number of soil-conservation agreements with owners and operators has more than doubled and the work accomplished has increased 2.4 times The ratio of contributions to the appropriated dollar has increased from $2.96 to $5.44. On 16 reservations, where it has been possible to make a continuing analysis for several years agricultural production in 1953 increased by $50.47 for every dollar spent by the Bureau and for every dollar spent by the cooperators on soil-conservation production increased $6.27. Median increase per acre was $13.50 or 39.5 percent. Maximum increase was an average of $50 an acre on 57,741 acres on the Yakima Reservation, Wash., amounting to $2,887,050 for this one reservation alone.

IRRIGATION

During fiscal 1953, irrigation facilities were extended to approximately 11,300 acres of new lands on the various irrigation projects located on Indian reservations. This involved the drilling and equipping of 11 wells, the construction of approximately 63 miles of canals and laterals, the replacement and construction of approximately 562 various types of water-control structures, and the construction and raising of small dams and reservoirs to provide an additional 14,800 acre-feet of storage capacity.

Indian irrigation projects range in size from a few acres for subsistence garden purposes to large projects consisting of 100,000 acres and are often the only means of obtaining a livelihood for resident reservation Indian families. Crops produced on these projects during the calendar year 1952 were valued at $58,986,816.

Power facilities on the Colorado River, Flathead, and San Carlos Indian irrigation projects were extended to serve an additional 309 customers. This involved the construction and extension of approximately 93 miles of transmission and distribution lines, the construction of 4 substations, conversion of 2.5 miles of transmission lines to larger capacities, and the installation of service connections. These power systems provide electrical energy for project use and serve the adjacent surrounding communities and in almost all instances are the only source of power available to the customers.

The extension of the project power systems to Indian homes has provided the Indians with the normal comforts of life. Many Indian homes are now provided with all varieties of electrical household appliances as well as electrically operated cooling systems.

Surveys, investigations, and field studies were continued on various projects in order to provide additional engineering data for feasibility reports and the continuing of proper and adequate construction programs. Work on the proposed Shiprock project, which is the largest and principal development on the Navajo Reservation in New Mexico, included the continuation of project planning surveys, water studies, soil analyses and the preparation of reports and preliminary designs and estimates. The preparation of a feasibility report to obtain congressional authorization for construction of the project is also in process. A redesignation survey of irrigable lands on the Flathead project was completed during the year after 2 years of extensive work. Extensive ground-water studies are being conducted on many of the rancherias and reservations in California where water is considered one of the most valuable assets of the Indians in view of the acute competition for water. Ground-water studies are also being conducted on the Ute Mountain Reservation in Colorado.

In addition to the usual and regular preliminary and preconstruction surveys, extensive field examinations and studies and the collection, preparation, and assembling of data for protection of Indian water rights were continued during the year for use in connection with the water suits entitled, *Texas* v. *New Mexico* and *Arizona* v. *California*. If the United States intervenes in these suits, Indian water rights may be vitally affected.

The more important Indian irrigation-development work during the year was on the Colorado River Reservation in Arizona, the Yakima Reservation in Washington, and the Navajo Reservation in Arziona and New Mexico. The work on the Colorado River Reservation was principally the clearing, leveling, and development of new lands and the extension of the drainage system to prevent waterlogging. The overall irrigation-development program for this reservation is the expansion of the irrigation project to its ultimate area of 100,000 acres, of which 75,000 acres on the southern portion of the reservation are being developed to provide resettlement opportunities for Navajo, Hopi, and other Colorado River Basin Indians lacking adequate economic opportunities on their home reservations. During the year, 6,320 acres of completely developed new land were assigned to 137 Indian families on a use-permit basis, increasing the assignments of these Indian families to approximately 80 acres per family. The original assignment of 40 acres per family were increased to 80 acres as a result of studies conducted by the Bureau of Agricultural Economics, which determined that 80 acres were an economic unit. An additional 2,180 acres of developed lands remained unassigned at the close of the year. During the calendar year 1952, crops valued at $4,892,853 were produced on 32,698 acres of project lands.

On the Yakima Reservation, the Wapato Satus Unit of the Wapato project placed under cultivation during the year approximately 4,000 acres of new land. Upon completion of this unit, an additional 8,000 acres will be made available. Crops produced on the Wapato project for the calendar year 1952 were valued at $20,628,291.

Work on the Navajo Reservation included the subjugation of 883 acres on the Hogback project, which were assigned to 44 Indian families in producing units, and the construction of storage facilities to provide an additional 14,800 acre-feet of stored water for use on the Naschitti and Choiska projects. Land leveling was also started on 800 acres on the Red Lake project, which will provide an additional 26 farm units. Irrigation facilities were also extended on the Ganado-Cornfield project, Fort Defiance project, and the Round Rock project. Crops produced on the various projects on the Navajo Reservation for the calendar year 1952 were valued at $912,784.

FOREST AND RANGE MANAGEMENT

Steadily increasing Indian participation was the keynote of forest and range work in 1953 on practically all reservations. Bureau policy strongly encouraged such participation looking toward the time when the Indians will be qualified to manage these resources on their own responsibility and without Federal guidance.

Through agreement with the Bureau, the Umatilla Indians of Oregon assumed full responsibility for the financing of forest management and protection work on their reservation for the duration of current timber sales. Supervision of the sales, however, necessarily remained a Bureau responsibility. Through similar agreement, the San Carlos Indians of Arizona began participating in forest management on their reservation by providing funds necessary for employment of additional forestry personnel needed for supervision of timber sales and for a timber inventory based on the latest aerial photography and groundcheck methods. The Yakima Indians of Washington also provided funds for employment of additional forestry personnel needed for sanitation-salvage sales of timber damaged by epidemic beetle attacks. On the Navajo Reservation a complete timber-inventory survey and a management plan were completed with funds provided by the tribal group.

The following brief statistical statement shows a comparison of some of the major activities in forest and range management over a 3-year period. It is noted that a lesser volume of timber was cut in 1952 than in 1951. This was caused principally by a decrease in volume of cutting on the Klamath Reservation. It is also noted, however, that total value of timber cut in 1952 was greater than in 1951, despite the decrease in volume.

Operating statement and comparison of forest and range management activities over the past 3 years

	Calendar years		
	1950	1951	1952
Timber sales:			
Total volume of timber cut, thousand feet board measure (including timber cut under permit and free use)	688, 791	719, 076	668, 554
Total value of timber cut	$6, 067, 847	$7, 720, 989	$8, 366, 531
Volume of timber cut under contract, thousand feet board measure	563, 401	586, 633	542, 701
Value of timber cut under contract	$5, 755, 403	$7, 387, 827	$8, 052, 343
Fire suppression:			
Total number of fires	904	931	1, 025
Area burned in acres	33, 808	52, 076	74, 508
Damage	$168, 282	$274, 523	$381, 137
Cost of suppression	$105, 710	$322, 882	$127, 590
Range management:			
Number of cattle grazed	620, 404	650, 029	624, 848
Number of horses grazed	99, 922	94, 039	92, 885
Number of sheep and goats grazed	967, 193	884, 782	969, 679
Cash income from grazing permits	$1, 806, 605	$2, 238, 499	$2, 526, 853
Value of free grazing	$3, 450, 049	$3, 478, 478	$3, 923, 816
Fish and wildlife: Value of fish and wildlife harvest	$2, 536, 998	$3, 097, 824	$2, 969, 556
Total cash income collected	$7, 562, 008	$9, 626, 326	$10, 579, 196
Total value other income, including free use	6, 299, 491	6, 909, 464	7, 207, 560
Grand total value and receipts	13, 861, 499	16, 535, 790	17, 786, 756
	Fiscal years		
	1950	1951	1952
Obligations from gratuity funds for forest and range management and fire presuppression	$1, 343, 629	$1, 525, 756	$1, 851, 829

ROADS

In addition to routine operations involved in maintaining approximately 19,000 miles of Indian roads and trails, the Bureau continued in fiscal 1953 to emphasize its program of repairing and rehabilitating deteriorated roads so that they might be transferred to the counties for future maintenance. The work consisted of resurfacing, regrading, and the rebuilding of wooden bridges where the roads and structures had fallen below standard as a result of traffic wear and climatic forces.

Although only about 75 miles of Indian roads were actually transferred to county highway agencies during the year, improvement work was completed on a much larger additional mileage covered by agreements with the counties providing for eventual transfer. It is estimated that as a result of the 1953 road improvement program, roughly 400 miles have been made ready for transfer at a reasonably early date. No roads were turned over to counties on such reservations as Navajo, Hopi, or Pine Ridge where county governments are either nonexistent or financially unable to assume the burden of maintaining Indian roads.

Because of the emphasis on transfer of road responsibilities to the counties, the Bureau has restricted its construction of new road facilities largely to the Navajo and Hopi Reservations where the work is going forward as part of the long-range program.

ARTS AND CRAFTS

The Indian Arts and Crafts Board, responsible for supplying technical assistance to individuals and groups in production and marketing of Indian crafts, continued its efforts to acquaint the craftsman with the principles of sound business procedure, to place the Indian crafts organizations on a sustained, self-operated foundation, and to bring before the public the products of the Indian artist and craftsman. With one exception, every organized production group had an increase of sales for 1952 over 1951.

Throughout the year, the Board rendered technical advice and management supervision of varying degrees and kinds to 20 crafts organizations; cosponsored exhibitions of Indian arts and crafts with various crafts organizations and museums; cooperated with organizations interested in Indian arts and crafts through public addresses, displays, television shows; published and circulated 4 issues of the newsletter Smoke Signals to Indian crafts groups and individual craftsmen and others interested in Indian arts and crafts; circulated explanatory brochures about Indian crafts to individuals requesting information; instituted a 4-year scholarship in collegiate business training for an Indian student; aided in the recruitment of crafts personnel for foreign assignment in connection with the Technical Cooperation Administration of the Department of State; participated in the Indian Bureau's summer school arts and crafts forum; and advised with public and private individuals and groups relative to the entire scope of Indian crafts.

Special assistance was given during the year to promoting the jade project at Shungnak, Alaska. By the close of the year finished products in limited quantities were on sale at a number of shops in the States, including the Indian Craft Shop in the Interior Building in Washington, D. C.

Reorganization of the clearing house at Juneau, Alaska, was completed and the organization was renamed the Alaska Native Arts and Crafts Association. The reorganized association did a gross business of $154,932.08 in 1952, an increase of $26,587.24 over the previous year.

In close cooperation with the Indian Bureau and the city officials of Rapid City, S. Dak., a complete reorganization was made of the Sioux Indian Arts and Crafts Shop and Museum there. The displays were revamped, the sales division enlarged, and the staff adjusted for better operation of the whole program.

MANAGEMENT

In fiscal 1953, the Bureau continued to strive for increasingly efficient administration, at reduced cost, of its varied and complex programs. Significant progress was also made in developing administrative practices related to withdrawal activities.

Management Activities Related to Withdrawal

Special emphasis was given to the withdrawal activities of the Bureau through field studies of the organization and administrative problems involved in withdrawal at the Flathead agency in Montana, the western Washington agency and the Sacramento area office.

Transfer of the Hayward Hospital to the Hayward Area Memorial Hospital Association was accomplished toward the end of the fiscal year in accord with the Bureau policy of withdrawal and in the best interests of the Government and the Indians of Wisconsin. Arrangements were also made with the General Services Administration and the Department of Health, Education, and Welfare for the transfer of school properties to States and local school districts.

Emphasis was also given to the disposal of various types of utilities and service properties which have been maintained by the Bureau at various field installations. These included: (*a*) Electric power and telephone facilities, which are being sold to public-utility companies wherever arrangements can be made to obtain equal or better service at lower cost to the Government; (*b*) dairy herds maintained at several of the Bureau schools which are gradually being liquidated; (*c*)

Bureau-operated laundries and fabricating plants, maintained in connection with boarding schools or hospitals, which are being discontinued as rapidly as service can be obtained from commercial sources; and (*d*) consolidated garages which are being discontinued in favor of commercial services except in the most isolated agency installations.

Management Improvement

Projects completed in fiscal 1953 for the purpose of strengthening the coordination and direction of Bureau efforts through improved management practices included: (*a*) The extension of the Bureau's management-improvement program to the agencies and field surveys to determine the effectiveness of the program at the agencies and area offices; (*b*) the study of the distribution, availability, and use made by the Indian Affairs Manual by the field offices; (*c*) administrative workload analysis of area offices and agencies for the determination of the administrative work demands of the separate activities; and (*e*) the decentralization of the incentive-awards program by increasing the responsibility of the area directors for the effectiveness of the program in their areas and by delegating to them the authority to grant awards.

In the field of personnel management the Bureau stressed supervisory training, emphasizing the responsibility of the supervisors for dealing with their employees in the development of sound supervisor-employee relationships and to assure the most productive use of time, skill, and abilities of its personnel. Further decentralization of personnel activities was accomplished through the delegation of classification authority up to GS–12 to most area offices. The understanding and use of classification as an important management tool for improving personnel management in the Bureau was also stressed. The Bureauwide within-service promotional program was strengthened by greater participation of supervisors in the program.

The new accounting system, developed in 1952 by Department and Bureau officials in cooperation with representatives of the General Accounting Office, was installed during 1953 in all accounting offices of the Bureau. Progress was made in integrating the budget procedures with the accounting system so that information supplied from the accounts would be susceptible of use for both budgeting and management purposes. Work continued on integrating the old irrigation accounts into the accounts provided for under the revised system. Further studies were undertaken with a view to simplifying and treamlining the reporting requirements under the revised system. As he year came to a close, efforts were being devoted to refining the ystem as required to meet special needs and conditions.

Considerable progress was made in property-management activities through a continuing campaign of cleaning up and disposing of a half-century's-accumulation of scrap and unserviceable buildings for transfer or sale. The revaluation of employee quarters in accordance with the Bureau of the Budget Circular No. A–45 was completed and the records-management program was put into full effect at most field installations.

BUREAU OF LAND MANAGEMENT

Edward Woozley, Administrator

INTRODUCTION

The Bureau of Land Management completed the fiscal year 1953 with a substantial amount in revenues collected from management of public lands and a coordinated drive through all of its operations toward better land use and disposal programs in the public interest.

Income from all sources amounted to $66,800,000. The major part of these revenues, however, came from the administration of oil and gas and other minerals, from timber sales, and from grazing leases.

Through its basic operations in cadastral engineering, range management, minerals, forestry, and lands, the Bureau of Land Management has made many major contributions to the development and use of natural resources on public lands. Under its jurisdiction are some 180 million acres of public domain in the United States and 290 million acres in Alaska. In addition, this agency is responsible for the leasing of minerals on approximately 700 million acres of federally owned lands and about 50 million acres of privately owned lands in which the United States Government has mineral rights.

A review of the work of each of the Bureau of Land Management's five major functions is given in this report. Highlights from the activities of its Division of Administration, Office of the Chief Counsel, and Office of International Cooperation are also included.

CADASTRAL SURVEYING ACTIVITIES

The function of cadastral surveys ranks high in importance in the work of the Bureau of Land Management. Those surveys create and establish land boundaries, identify the parcels of land, and afford descriptions and areas for the various subdivisions for title purpose. In those surveys the boundaries are actually marked on the ground by permanent monuments and in this respect the cadastral surveys differ from the purely informational surveys conducted by other agencies. The Bureau of Land Management is the official agency for conducting the cadastral survey of the public lands, including Indian reservations, national forests, etc. By appropriation limitation, the work of the Bureau is limited to the survey of the public lands under the jurisdiction of the Bureau of Land Management, except as such surveys are conducted for other Federal agencies on a reimbursable basis or as the result of private contributions.

The cadastral surveys are prerequisite to any comprehensive program of land management or development. It is fundamental that the boundaries of the parcels of land being administered must be known definitely before funds are expended for their improvement or the resources of such areas developed or harvested. The timber management, soil conservation, range improvement, and reclamation projects which are so vital to the economy of the western public-land States are dependent upon adequate cadastral surveys as a basis for their development and administration. Lands cannot be transferred to the States in satisfaction of their school grants until they have been first identified by cadastral surveys.

In realization of the basic importance of those surveys, the cadastral program of the Bureau of Land Management in fiscal 1953 was designed to aid in the fullest development of the natural resources. In that program emphasis was placed on the requirements for surveys necessary for the timber salvage operations in western Oregon and California and in the areas of high potential for important mineral development as well as in those other areas where livestock forage, normal timber production, and homesites are the important considerations.

The requests for surveys which originate with the other operating functional divisions of the Bureau, as well as the States and industrial organizations, are of necessity carefully screened to accord with funds available for the work. In establishing the work program, priority determinations are the result of careful consideration of the urgency of each project for development and management of the lands and of the immediate use and benefits resulting from the surveys.

Surveys in the Continental United States

Nearly 15 percent of the total area of the 11 Western States has not been covered by the rectangular survey net of the public lands. Of the approximately 100 million acres of unsurveyed public domain in those States considerable portions are within national forests or other permanent reservations where the need for the surveys is not urgent. However there are extensive areas on which surveys should be made for identificaiton of State school lands, to facilitate development of mineral resources and provide the basic data necessary for proper administration and development of the areas. In addition there are areas embracing millions of acres in which the need for resurveys is urgent due to obliteration of the monuments and other marks of the original surveys executed many years ago. Title to approximately 50 percent of the area of the 11 Western States is still in the Federal Government. The extension of the basic cadastral surveys and resurveys of this Bureau in that area is necessary for the development and useful conservation of the resources of those lands.

In continuing the cadastral program during the fiscal year 1953 there were surveyed or resurveyed approximately 1,646,850 acres of land. That program included the accomplishment of such important and essential work as the identification of lands for the Atomic Energy Commission in the development of uranium deposits; the extension of exterior township boundaries for control in development of mineralized areas; the surveys necessary for determination of the boundaries of timbered lands under the jurisdiction of this Bureau for the conduct of the essential salvage operations in Oregon and California, as well as resurveys to establish the boundaries of Federal lands under the jurisdiction of this Bureau in other public land areas and surveys necessary for the management and improvement of grazing lands to improve the forage and grazing capacities. The cadastral program also included the survey of more than 1,100 small tracts which provide homesites to meet the demand created by population growth in certain Arizona, California, Montana, and Wyoming localities and for vacation homesites in those States and Florida. The investigation of accretion areas to determine ownership and the survey of islands and omitted areas in Florida, Louisiana, Michigan, Missouri, North Dakota, Utah, and Wisconsin was also included in the program.

The program also included the resurvey of vast areas within reclamation projects such as the Missouri River Basin development, the Colorado-Big Thompson project and the Davis Aqueduct and Gateway Canal units, as well as the survey of approximately 390 miles involved in the establishment of reservoir boundary and rights-of-way traverses. For the Bureau of Indian Affairs resurveys were executed to accommodate oil and gas leases on the Southern Ute Reservation in Colorado and to determine the boundary of the Mescalero Indian lands in New Mexico.

Surveys in Alaska

It is recognized that the Bureau's cadastral survey program in Alaska should be accelerated to define the boundaries of homesites, homesteads, trade and manufacturing sites, and so forth, incident to the rapidly expanding development of the Territory. It is reported that the settlement of the public lands and the development of the resources in Alaska is seriously retarded by the lack of adequate surveys.

The field program carried forward in Alaska during the fiscal year 1953 was designed to accommodate the most urgent projects. That program was carefully developed within the limits of funds available and was completed. Survey or resurvey of 12,720 acres of land under the rectangular survey net was accomplished, as well as the segregation of 50 miles of highway right-of-way, which made available 6,500 acres of land for agricultural and home purposes; the survey of 53 homesites and homesteads, 11 trade and manufacturing sites, 10 headquarters sites, and 2 municipal airports. Also surveyed were 447 town lots in 4 townsites and a total of 2,877 small tracts made available for homesite development during the year.

This Alaska program will contribute much to the development of the Territory but it must be considered as only a step in the accomplishment of the full program needed in Alaska.

RANGE MANAGEMENT

Public lands administered by the Bureau of Land Management in the 11 Western States constitute an important watershed and range area, virtually all of which is used for grazing by domestic livestock and wildlife.

Administration of Grazing Districts

The more concentrated portions of these lands, generally spoken of as the Federal range, have been included within 59 grazing districts established under the Taylor Grazing Act. They vary in size from 2 million to 9 million acres and embrace approximately 160 million acres of reserved and unreserved public lands, and lands administered under agreement. It is estimated that 147 million acres can be used by domestic livestock. Within grazing districts, forage is reserved for reasonable amounts of wildlife and grazing privileges for domestic livestock are granted under a permit system specifying the numbers and kinds of livestock and periods of use.

Permits and licenses issued to approximately 20,000 operators authorize the grazing annually of 8.7 million head of livestock on the public lands within grazing districts. Included are 2.4 million cattle, 63,000 horses, 6.2 million sheep, and 15,000 goats. Nearly 800,000 big-game animals get part or all of their forage from the Federal range.

Continuing progress has been made through a more intensified program of management and supervision of the Federal range and its uses. Range management has been facilitated by increased activity in adjudication of range privileges, range resource inventories, and dependent ranch property surveys. The rising demand by grazing permittees for closer supervision of seasonal uses and stocking rates on ranges shows a greatly changed attitude toward administration of grazing by the Bureau under the Taylor Grazing Act. The cooperation of range users and advisory boards reflects a better understanding of the need for more intensive management of the Federal range.

To facilitate and improve administration within the regions, several realinements or combinations of grazing districts have been initiated. These boundary modifications are designed to improve administration and to provide better services to range users.

Administration Outside of Grazing Districts

Unreserved public lands lying outside of grazing districts occur usually as small tracts scattered among private land holdings and are leased for grazing under section 15 of the Taylor Grazing Act. The total area of these lands is approximately 28 million acres, of which 16 million acres are under lease to more than 1,000 livestock operators. About half of the unleased land has little or no grazing value because of isolation, topography, deficient soils, or climate, or a combination of these factors.

Interrelationship in Grazing Control

Because of the many and diverse interests in grazing lands brought about in part by the complex land ownership pattern in public-land States, cooperation in grazing land control assumes an important role among State, county, private, and Federal agencies.

The common objectives of these agencies are aimed at perpetuation of the resources of all rangelands through proper use, protection and development; sufficient forage for desirable numbers and species of wildlife; practical correlation of the use of public rangelands with the use of dependent privately owned lands; and maximum stabilization of that part of the livestock industry dependent upon these lands.

An outstanding example of this policy is the agreement between the Forest Service and the Bureau of Land Management to correlate grazing use of adjacent lands under separate administration by the two agencies. Where lands under the administration of the two agencies are used by the same permittees, every effort, within administrative limits, is made to consider the lands as a unit in working out livestock numbers and seasonal adjustments, methods of management and development of improvements.

Studies

Following are the principal fields in which studies are under way in cooperation with State and Federal agencies:

The Squaw Butte Experimental Range Station maintained cooperatively with Oregon State College, is working on improved systems of range use and is developing improved forage plans and better methods for range revegetation.

Cooperation with the Geological Survey involves two lines of work in addition to regular service functions: (*a*) Studies of the hydrologic characteristics of individual watersheds under conservation treatment, (*b*) studies of the influences on surface and ground-water characteristics by range waterspreading systems. Storms of an intensity exceeding 50-year frequency this spring thoroughly tested waterspreading systems in Montana designed on the basis of studies under (*a*).

Halogeton control studies are being made at Land Grant Colleges in Idaho, Nevada, and Utah with Bureau support. These studies are part of a general coordinated halogeton research program in which interested State and Federal agencies are participating.

The Bureau is cooperating with the Forest Service on range reseeding problems and the development of specialized range conservation equipment not available commercially. Of unusual interest is the development of a contour furrowing implement and a gyroscopic inclinometer or precision grade indicator for mounting on tractors. This instrument may eliminate much of the topographic engineering required for waterspreading systems and other practices installed on the contour of the land.

Some studies are conducted independently by the Bureau in connection with regular functions. In anticipation of a possible realinement of grazing fees, a study was undertaken to develop methods for establishing proper charges for grazing, and range improvements. A procedure is being developed for evaluating range condition and trend and the Bureau's accomplishments in range management. The Bureau also maintains numerous observation and adaptability plots which serve as guides in managing and developing the range.

Range Conditions

A critical drought condition in the Southwest over extensive areas has reduced forage resources to the lowest ebb in many years. This drought has dealt a general destructive blow to the southwestern live stock industry necessitating prolonged supplemental feeding, movement or sale of livestock out of the area, and reduction of breeding herds. Summer rains in 1953 could partially alleviate the situation.

Northern ranges suffered from the effect of light fall and winter precipitation and spring forage growth was delayed due to unusually low temperatures and drying winds. Late spring rains reversed the trend, and by mid-May forage production on these ranges was at or above normal.

Wildlife Management

Major problems incident to the management of wildlife resources on the public lands are primarily concerned with numbers of big-game animals exceeding the available winter forage supplies. The mildness of the past winter did not contentrate game herds on limited range areas as much as usual, thereby affording browse plants on these areas some relief from recurrent overuse. Because of the open weather, winter wildlife losses were below normal. While definite progress is being made in finding solutions for congested game areas, low hunter kills last fall and the past open winter may result in even greater population increases during the present year.

The Bureau is working in cooperation with State wildlife agencies in each of the States having serious big-game congestion problems, attempting to devise management practices that will reduce herds in line with the grazing capacity of the range. In some States bag limits on deer, for example, have been increased to 2 and even 3 animals per hunter in an effort to control numbers. Other plans tried include post-season hunts on antlerless deer, hunter's choice, and various open-season special hunts. Since several of the overpopulated areas are located in isolated and inaccessible country, it is difficult to induce many hunters to participate in the special hunts.

Wildlife populations on the public lands have been increasing steadily for many years. The outstanding example of this increase is in numbers of antelope in Wyoming. Back in 1939, the total hunter kill of antelope was 3,900 head. By 1952, the hunter kill had increased to 42,000—almost 11 times the 1939 kill. Most of the antelope in Wyoming are found on public land.

Soil and Moisture Conservation

A major transition in programing this activity from a selected area to a watershed basis was initiated in the previous fiscal year. Soil erosion control and runoff retardation measures have been generally applied on the public lands in keeping with the new approach. In addition, installations on several critical drainages were based on more precise operations planning embodying a system of watershed treatment specifically designed to meet the hydrologic and sedimentation characteristics of the watershed. Examples of these installations are Logan Gulch on Wind River, Wyo.; Willow Creek on Milk River, Mont.; and the San Simon Wash in Arizona. Technical assistance on basic physical data was furnished cooperatively by the Geological Survey and other Federal agencies. The transition will gradually be completed so that all soil and moisture conservation programing will be made on this basis.

Range revegetation, an important conservation practice, has been aided materially through close cooperation with the Forest Service Range Reseeding Committee. Participation in committee functions has furnished the Bureau with the latest results of research on revegetation techniques which have been applied to field operations. The Bureau has also participated jointly in the development of improved reseeding equipment utilizing the facilities of the Forest Service Equipment Development Center at Arcadia, Calif. The adoption of improved reseeding methods and equipment has resulted in more complete elimination of plant competition, proper seedbed preparation, and better placement of seed with correspondingly improved results in the stands of grass obtained.

In contrast, are range revegetation methods by aerial pellet reseeding which was tried on 77,000 acres of depleted rangeland 5 years ago. Periodic inspections since these trials were made have failed to reveal any measurable success of this method. Revegetation specialists and ranchers are becoming convinced there is no substitute for recognized dryland cultural principles in obtaining successful range reseedings.

Halogeton Control

The poisonous range weed, halogeton, continues to invade western rangelands and cause livestock losses. The area of infested public land increased from approximately 1,100,000 acres in fiscal year 1952 to more than 1,500,000 acres in fiscal year 1953. This increase is mostly due to the gradual enlargement of many scattered infestations, although numerous new spot infestations were discovered during the past year.

Differences in opinion as to the most effective methods of controlling halogeton still prevail, probably as a result of a lack of basic information on the weed itself. Chemical sprays now available give only erratic results but are an important factor in controlling spread through a reduction in seed volumes. Reseeding infested and threatened rangeland to hardy perennial grasses has proved to be the most effective permanent method of control now known.

Funds for 1952 control work were not available in time to begin large-scale control operations during the work season. As a consequence, most of 2 years' programs were placed in operations during the 1952 work season. To date more than 200,000 acres have been reseeded and an additional estimated 20,000 acres of seedbed have been prepared for 1953 fall seeding. More than 4,000 miles of infested rights-of-way and more than 19,000 acres of spot infestations have been treated with chemical sprays. Technical assistance in evaluating control results is being furnished cooperatively by several land-grant colleges.

Range Improvements

The program of range improvements to facilitate the management of range livestock is closely coordinated with the planning of conservation practices to obtain maximum efficiency in the development of range resources. During the past year unfavorable climatic conditions and outbreaks of insect pests caused some shift in emphasis in project planning. Continued drought in the southern portions of the range States has kept stock-water development in the forefront. Serious infestations of Mormon crickets in several States, particularly in Nevada and Colorado, motivated the Bureau to join forces with the United States Department of Agriculture and public-land users in a cooperative control program. Outbreaks of grasshoppers were a serious problem in other localized range areas.

The construction of division and allotment boundary fences received strong impetus from the completion of grazing-privilege adjudications and the establishment of large-scale conservation programs. In part of Montana Grazing District No. 1, the range-improvement fee was increased nearly seven times to finance a major fence-construction program that in 3 years will enclose all individual allotments. Excellent cooperation was received from range users in the form of generous contributions to all types of range improvements.

DIVISION OF MINERALS

In recognition of the increasing interest and importance of the federally controlled mineral resources on the public domain and acquired lands, the Division of Minerals, first established in the Washington office in 1952, was organized in every region where warranted during the fiscal year 1953.

Further reorganization of the Washington office saw the establishment of the Branch of Leasing and the Branch of Mining in the Division of Minerals. Delegations of authority and responsibility to these branch Chiefs have increased efficiency and effectiveness of Division operations.

Leasing of Mineral Resources

Oil and gas and other mineral leasing activities of the Bureau continued at a high level during fiscal 1953. More than 16,500 oil and gas offers for leases were filed and better than 800 other applications were received. At the end of the fiscal year, there were more than 78,000 oil and gas leases outstanding on the public domain, embracing almost 60 million acres, and over 2,000 oil and gas leases outstanding on acquired lands covering more than 1,800,000 acres. There were 950 leases for other minerals outstanding covering an area of more than 900,000 acres.

Mining Activity

Applications for patents on placer and lode claims under the United States mining laws continued at a high level, with 144 applications being received and 61 patents issued. There is evidence that activity under the mining law will show a major increase during fiscal 1954. The experimentation by the Bureau of Mines on the mining and processing of oil shale may cause increased activity in this mineral, but also the continuing requirement of annual assessment work and the continued agitation for revision of the mining laws may cause many claimants to apply for patents.

The operations of the Mining Branch of the Minerals Division are of importance to the national defense effort. In region II, Division mining engineers have been concentrating on one large defense project, the Marine base in the vicinity of Twentynine Palms, Calif. This project involves the determination of the validity of approximately 3,000 mining claims. In addition, the region has been asked to appraise the value of about 25 mining properties in this project on which a great deal of work has been done and on some of which there are extensive mining workings. Extensive mineral examinations were initiated and made for the Gifford Pinchot National Forest in the State of Washington, Lucky Peak Dam and other substantial areas, making a direct contribution to the needs of national defense, public works, flood control, and better utilization of lands and mineral resources.

The new director of the Bureau has inaugurated through the Division of Minerals a closer contact and cooperation with mining industries and their legal and technical representatives in order to reach a better understanding and solution of mutual problems. The policy has emphasized the Bureau's desire to assist the development of the federally owned mineral resources by private industry. During the year, the Division of Minerals began a study of more efficient and simplified methods of processing mining cases under the United States mining laws, particularly in the fields of abstracts of title, examinations, and contested cases resulting in hearings, with the purpose of performing functions more economically and expeditiously.

Alaska

Of outstanding importance during fiscal 1953 was the increased interest in the development of minerals in Alaska. The geographical range of oil and gas filings in this Territory are of considerable interest. A large group have picked the areas of the Wide Bay, Cold Bay, Iniskin Bay, and from Kenai to Homer on the Kenai Peninsula. Another group has picked the Tuxedini Bay area, and several groups are interested in the area north and west of Anchorage. Exploration and drilling has started in the Yakataga-Kattelo area. The interest in Alaska is not only in oil and gas but also in coal, for which 12 prospecting permits covering 26,900 acres were issued. There would probably be even greater interest in the Territory except for the fact that large areas of land are still withdrawn for military purposes.

Revenues

The revenues from royalties, rentals, and filing fees under the Mineral Leasing Act remained at a high level during the fiscal year. Out of the total revenue of over $66,800,000 from the various public land source activities, $49,200,000 of that amount was derived from leases issued under the Mineral Leasing Act. The majority of receipts under the Mineral Leasing Act were from royalties, rentals, and bonuses for oil and gas leases.

A summary of mineral leases issued competitively, by States, on lands within known geological structures, follows:

Oil and gas competitive leases

State	Acreage	Bonus
California	120.00	$12,600.00
Colorado	71.63	762.12
Kansas	367.04	18,400.00
Louisiana	2,343.79	1,037,052.86
Montana	6,363.72	495,648.90
New Mexico	227.14	29,095.00
Oklahoma	40.00	1,535.60
Texas	60.00	126,300.00
Wyoming	1,435.87	84,080.84
Total	11,029.19	1,805,475.32

Other competitive leases

Mineral	Acreage	Bonus
Phosphate	2,768	$23,730
Coal	4,040	12,475
Sodium	1,643	100
Magnesium	855	10,043
Total	9,306	46,348

DIVISION OF FORESTRY

Public domain forests and woodlands under the jurisdiction of the Bureau for the most part are lands unsuitable for homesteading or disposal under other land laws. The Bureau also administers the valuable revested and reconveyed Oregon and California Railroad grant and Coos Bay Wagon Road grant lands which were returned to the Government after the terms of the original grants were violated. In addition, vast areas of forest and woodland in Alaska are a Bureau responsibility.

Size of the Forest Resource

There is a tremendous volume of wood suitable for lumber, paper pulp, veneer, and other forest products in these forests and woodlands. Most of the lands are situated in the Western States and Alaska with relatively minor acreages east of the Mississippi River.

The O. and C. and C. B. W. R. grant areas are comprised of 2,610,867 acres of timberlands in western Oregon. BLM foresters have estimated that these lands support a total volume of 60 billion board feet of high-quality old-growth Douglas fir and associated species, and have a sustained-yield capacity of 900 million board feet per year.

The total area of commercial forest on public domain lands in the United States is estimated to be 4,401,958 acres. The estimated volume of timber on these lands is 20,157 million board feet with an annual allowable cut of 237 million board feet. In addition, there are approximately 30 million acres of public domain woodland supporting an estimated equivalent of 42,587 million board feet of wood material with a possible sustained-yield capacity of 259 million board feet per year. These estimates are purposely conservative because many of these lands are subject to the rights of the States to select them as compensation for areas lost through the creation of Federal reservations, such an national forests, national parks, and military reservations.

In Alaska, the Bureau is responsible for 40 million acres of forest land of commercial type and 85 million acres of woodland supporting, respectively, an estimated 180 billion and 170 billion board feet of forest products. These lands have an estimated combined total sustained-yield capacity of 2,300 million board feet each year.

Management of the Forest Resource

The BLM program is one of sustained-yield forest management giving due weight to the relative importance of the soil conservation, wildlife, and recreational values of the forest.

Sustained yield for extensive forest areas generally is understood to mean the largest possible annual wood returns of approximately equal volume, realized continuously over the period of years necessary for young trees to grow to maturity. Sustained-yield management of scattered isolated tracts as defined above, is practical whenever these scattered tracts are grouped together naturally as a source of timber for the same marketing area and all are economically accessible to means of transportation. A study of the lands under Bureau jurisdiction shows that its forestry program deals in large part with the management of such tracts.

O. and C. and C. B. W. R. lands.—The act of August 28, 1937 required that the forests on these lands be managed in accordance with the principles of sustained-yield management. Accordingly, the area was divided into 12 master units. Each of these units was made tributary to a specific marketing area and was assigned a definite sustained-yield timber cutting quota. Each marketing area was designed to include several forest industry towns with the widest possible variety of manufacturing processes and several mills representing each process. The purpose of these precautions was to assure free competition for Government timber and to avoid any undue competitive advantage to particular towns, processes, or companies. Wherever timber on the O. and C. and C. B. W. R. lands is sold it must be manufactured through the stage of primary manufacture, meaning the rough lumber stage or the equivalent stage in the case of other products, in the particular marketing area to which the timber is committed. After 10 years of trial, there is definite evidence that the plan is accomplishing its purpose.

Access roads.—Because of the rough, mountainous character of western Oregon, access logging roads are costly and suitable locations scarce. For economic reasons it is desirable to avoid duplicating systems. To solve the problem reciprocal road use rights have been obtained from roadbuilders as a condition of the granting of rights-of-way across O. and C. lands. When the owners of intermingled private land build road systems to reach their own lands they unavoidably cross the O. and C. lands. Longtime road agreements between the Bureau and the private land owners are being negotiated and a number are now in effect. By these agreements, the road systems, their costs of construction, and the maintenance costs are borne jointly. These costs are prorated partly against the Government and partly against the private timber in proportion to the timber volume in each ownership. The private cooperator builds the road system according to a development plan covering a definite term of years. The Bureau agrees to offer the Government timber for sale at the sustained-yield rate during the specified term of years. The Government timber is sold by oral auction procedure, thus allowing the road owner to meet any high bid if he so desires. In case the cooperator does not elect to pay the competitive price, under the terms of these agreements, he makes his road system available to the successful bidder at a fair price.

To accelerate the salvage of large quantities of windthrown and beetle-killed timber, the access problem is being met in part through the construction of public access roads with appropriated funds. This is done only where it is impractical to get privately constructed access roads into large bodies of dead and damaged timber promptly, or where road investments would be prohibitive for the logging operators. During 1953, construction of the Quartzville access road was continued, and work was begun on the Smith River access-road system.

Timber salvage.—In western Oregon, Washington, and northern California, there exists a Douglas fir bark beetle epidemic of near disaster proportions. During the past several years, the fir forests became spotted with an increasing number of small groups of windthrown trees. By the fall of 1951, most of these areas of down trees had developed borders of standing red-topped trees which were dead or dying from the attack of bark beetles bred in the windthrown trees, proof of the existence of an abnormally large beetle population. During December 1951 winds of hurricane velocity uprooted large numbers of trees. The total volume of windthrown timber on the O. and C. lands alone is estimated at 3 billion board feet. On other lands, there is probably twice as much more. The enormous volume of damaged timber at a time when the beetle population is already high, increases the probability that further heavy losses due to beetle attack will occur.

The only practical known means of controlling or minimizing the beetle attack is by logging the area and removing the affected timber so that it cannot serve as a breeding ground for beetles. This job is being done as rapidly as funds allow. During fiscal year 1953, 268,046,000 board feet of salvage timber were sold for $5,640,937.47. This salvage work is now estimated to be about 29 percent complete.

Marketing.—Thus far, on the average, it has been possible to market only about half of the estimated 900 million board-feet sustained-yield capacity of the O. and C. and C. B. W. R. lands because of the shortage of personnel and lack of access roads. In fiscal year 1953, a total of 626 million board-feet of timber, including salvage, were sold for $13,900,000, the largest volume and highest sales value of timber sold in any single year in the history of the O. and C. lands.

On January 16, 1953, the Department issued new timber-sale regulations and authorizations delegating more authority to district foresters in the issuance of timber-sale contracts. This should enable the Bureau to offer a larger volume of timber for sale and should promote more efficient sales administration.

Public-domain lands.—The forest-management program being developed for the nearly 44½ million acres of public domain commercial forest lands in the United States and Alaska is similar in objectives to the O. and C. program, but, as yet, much less intensive. It is only within recent years that the timber on these lands has been recognized as being of great economic importance to the localities in which it is found. The law under which green timber can be sold, clearing the way for forest management, was enacted only 6 years ago on July 31, 1947.

Land tenure is indefinite for parts of this forest area and timber inventory data are unreliable or nonexistent for much of it. Uncertainty of tenure must be settled either by classification of these lands as suitable for management projects or by withdrawal action. More reliable data regarding timber volumes by forest type and age class and regarding growth rates are prerequisite to the preparation of plans to regulate cutting as well as other measures. During fiscal year 1953, region II obtained an inventory of the public domain timberlands in California. This work is continuing in the other regions.

The timber on these lands is being sold largely in response to application. Effective management calls for a more positive program with the Bureau taking the initiative in the selection of timber-sale areas. A great deal of the timber is overmature and its cutting under proper forest practices is a necessary conservation measure. Much larger volumes can and will be sold as funds and personnel become available. Limiting factors have been the capacity of available manpower to provide minimum supervision of the essential conservation measures for the proper utilization of existing timber and the growing of future supplies.

The strategic importance of Alaska has increased in recent years and much military development is under way. Large numbers of people have settled in the Territory and it is probable that the local demand for timber will grow proportionately. The white spruce forests of interior Alaska have a great potential value as a future source of supply for newsprint and other pulp and paper products. The character of this timber and its growth rate are equivalent to the forests of northern United States and Canada which now support an extensive pulp and paper industry. The current development of a large pulp industry on the Tongass National Forest in southeastern Alaska suggests that the day will come when similar industries will be based on the interior spruce forests.

The 30 million acres of juniper-pinon pine woodlands in the West generally lie in large, well-consolidated blocks within the organized grazing districts. Because large numbers of fence posts and other round wood used in ranch structures are sold annually from these lands, their wise use and protection from fire and trespass are of importance to the grazing industry. Since most of these woodlands are also grazing lands they serve a dual purpose and produce from both sources.

A few foresters are engaged in advising and guiding range managers in the preparation of type maps and management plans, and the development of standard cutting practices, as well as supervising sales of posts and other products. In some grazing districts, the volume of forestry work requires the permanent assignment of a forester to the staff of the range manager.

Income.—Returns to the Treasury from the sales of sawtimber and other forest products from the public-domain forests and woodlands have consistently been greater than the cost of management. In fiscal year 1953, 92 million board-feet of forest products were sold for $1,114,000, over two times the cost of administration.

Protection of Forest and Range Resources

Successful management of the Bureau's vast natural resources is dependent on its ability to furnish adequate protection from fire, insects, and disease.

Fire control.—Further improvement of fire control on the 400 million acres of public domain in the United States and Alaska has been accomplished with a minimum expenditure of funds.

The Bureau has strengthened its program of close cooperation with other agencies—Federal, State, county, and private. This is one of this agency's most important tools in obtaining good protection at low cost. It has purchased improved fire-fighting equipment for some of its areas of cooperative responsibility thereby raising the standard of protection. Further participation in fire-training schools conducted by other agencies has strengthened fire control on the grazing districts. In addition Bureau conducted fire-training schools have been expanded to include other phases of fire control such as aerial cargo-dropping procedures. Dependable communication, an essential of efficient fire control is being accomplished through the use of high frequency (VHF) radio and radio-telephone. VHF radio has been installed in three regions: (1) Idaho-Oregon, (2) Montana, and (3) Arizona, replacing obsolete medium-frequency sets. Two other regions have purchased VHF equipment for installation this year. In Nevada both radio-telephone and VHF radio work efficiently and arrangement for its use in Utah has been initiated. Further investigation is under way with a view of expanding radio-telephone service to the entire region including all of Utah and Colorado. Both systems permit noise-free communication during period of high electrical activity common during high fire-danger periods. High pressure pumps adopted as standard equipment by the Bureau will be purchased by all grazing districts as funds become available. These will be mounted on four-wheel drive trucks for the suppression of grass and brush fires. The smaller but more efficient portable Pacific marine-type pumpers are better suited for packing into fires in the forests of Alaska. In that area airplanes continue to be of great importance for rapid transportation of fire fighters to fires beyond walking distance of highways. Planes become increasingly effective for the detecting and scouting of fires. They are also used for air-to-ground contact with fire-fighting crews, and make it possible to guide and direct their work on the fire line with much greater efficiency.

The Bureau of Land Management has continued to protect under contract 5,700,000 acres of public domain in California, Idaho, eastern Oregon, Montana, Washington, Arkansas, and Minnesota. Three million, six hundred thousand acres of commercial forests, woodlands, and grazing lands, are located in areas too far from organized grazing district fire-control units to permit economical protection directly by the Bureau. The balance, 2,100,000 acres of Bureau lands in western Oregon bearing high-value stands of Douglas-fir timber was contracted to the Forest Service and to the State of Oregon. Timber sale and fire-contract stipulations were further tightened to avoid preventable losses similar to those of 1951.

Insect control.—Because insect infestations are difficult to detect in the endemic stage, they often reach epidemic proportions before adequate control measures can be effected. Annual damage by insects far exceeds that of fire and the ravages are much more difficult to control. An infestation of the Douglas-fir bark beetle has built up to epidemic proportions during the last 3 years in the Douglas-fir region of western Oregon, California, and Washington. The infestation was intensified because of exceptionally favorable breeding conditions created by fire damage to large volumes of timber and the uprooting of some 3 billion board-feet of timber by the violent storms of 1951, 1952, and 1953.

A cooperative survey was conducted in 1952 by Federal, State, county, and private agencies to determine the extent and severity of the epidemic. The survey indicated the damage was dispersed over 13½ million acres of all ownerships of which approximately one-third is under the jurisdiction of the Bureau. As a result of the severe winds in early 1953, a resurvey was conducted to determine the extent of additional wind damage and to check on the status of the beetle epidemic. Preliminary reports on the beetle situation indicated the epidemic may possibly reach its peak in 1953 or 1954. Data on the extent of additional wind damage are not as yet available.

The only effective means of control consists in the removal of the fire-killed and wind-thrown timber in order to reduce the breeding places of the beetles before emergence. This minimizes the attack. Salvage operations have been proceeding as rapidly as sale of the fire killed and windthrown timber can be processed. To further facilitate salvage operations it was necessary to construct access roads into some of the large bodies of damaged timber.

An infestation of spruce budworm in the Helena area in Montana has built up to epidemic proportions this year. A control program has been prepared to provide spraying this season with DDT of 26,696 acres of public domain adjacent to and intermingled with Forest Service, State, county, and private lands.

Disease control.—With the continued high demands on timber it is essential that disease prevention and control, in remaining commercial timber stands be maintained for maximum growth. The only disease control program in BLM commercial timber is for white pine blister rust, a disease common to 5-needle pines. It requires two host plants, white pine (sugar, eastern, and western white pine) and plants of the genus Ribes (currants and gooseberries). The blister rust control program on BLM lands was started in 1942 on an estimated total area of 150,000 acres of commercial sugar pine. The present project area has been reduced to 93,170 acres. During the last field season, 1,410 acres of BLM lands and 1,105 acres of National Forest, State and private and county lands in the Medford area in Oregon were treated with initial eradication and 7,946 acres with reeradication. As a sanitation measure timber sale contracts for BLM timber in New Mexico stipulate the removal of all mistletoe and conky trees along with other merchantable timber. Damage by these two pests in young growing timber is thereby reduced.

DIVISION OF LANDS

The unprecedented demand for public lands, shown in ever-increasing numbers of individual applications for specific tracts, reflects the high level of economic activity of the Nation and particularly of development in those sections of the country where public lands make up a large part of the total land area. Thus, certain sections of the West and Alaska, where most public lands are located, have experienced a variety of economic pressures from increasing population and the marked expansion of industry. These pressures are in turn reflected in applications for tracts of land for home, recreational, and business use, as well as larger areas needed for industrial expansion and mineral and other resource development.

Of major concern to the Bureau are State and Federal programs involving exchanges and withdrawals of public lands for military and atomic energy installations, recreation, and for resource development. These involve interagency cooperation and planning of a high order to insure that public lands will contribute the most through multiple-purpose resources development. A review of river basin studies illustrates how the Bureau cooperates with other agencies to meet the need for broad and comprehensive management plans of lands in Federal ownership.

Plans for use of the public domain depend essentially on the completion of a classification and inventory of remaining public domain to determine which lands should be (1) disposed of to private interests, (2) disposed of to States, and (3) retained in Federal management units. Without area classification, it is more difficult to take action on applications for tracts or resources because their effect on other public lands or on the economic activities of the region must be considered.

At the same time, as an overall program is being developed for public lands, the Bureau is faced with necessity for acting on applications from a greatly increased number of individuals hoping to settle on public lands, to develop agricultural areas through homesteading and desert land reclamation, or to make use of specific tracts as home or recreational sites.

Higher prices for materials and products, combined with tax incentives and the greater ease of obtaining risk capital, have made it economically feasible to develop many former marginal and submarginal areas. In California and Arizona, for example, a few phenomenally successful cotton farming operations in the desert areas have sparked the demand for lands in those regions where climatic conditions are favorable to cotton production. Many groups of persons, some with little knowledge of the requirements to bring land into agricultural production, have thus been induced to file agricultural applications. Here, as elsewhere, the number of applications has caused a backlog of cases slowing down ultimate determinations in all types of land applications.

The continuing increase of small tract applications, chiefly for home, cabin, and recreational use but also for various businesses, is the result in large part of the growing population in the West and of those who hope to move west.

The interrelation of public lands and the development of a growing region is also shown in Alaska, where the Bureau—particularly concerned with the management, use, and disposal of the resources of the land—is playing a vital role in development of the Territory. In order to facilitate the settlement that should accompany military and civilian construction, the Bureau's primary objective is to render prompt service on all applications for conveyance or use of the lands or resources.

At the request of the Secretary of the Interior, a review was begun of those areas of public land in Alaska now withdrawn from entry, especially those close to growing communities. Efforts are being made to reduce withdrawals to a minimum, to place the maximum amount of resources available for Alaska's expanding economy.

The Demand for Lands

The tremendous increase in applications for public lands—a 50 percent increase over 1952—has even greater meaning when compared to the 1940–45 average, a period prior to the postwar expansion of the civilian economy. In the war years, the Bureau received annually about 3,000 lands cases. During 1953, the total received amounted to 23,000 cases. Desert-land applications rose spectacularly from 50 per year in the war period to 3,300 in 1953. Applications for homesteads increased from the wartime average of 450 to 1,100 in 1953. Small tracts, increasingly popular, which showed demand of about 800 a year from 1940–45, rose to 13,500 in the past fiscal year.

While the underlying cause for this demand for public land is the expanding national economy, the direct cause is the necessity for individuals and industry to turn to the lands and resources of the public domain as a great source of available land.

Desert-Land Entries

The increasing demand for desert lands for agricultural purposes has created a considerable problem for the Bureau. Under the law, a desert-land entry may be allowed where an individual can prove that he has access to water, can bring it to the land, and can reclaim or irrigate the tract. The law and the regulations were drawn for application of surface waters to desert lands. Under these circumstances the factor of a permanent water supply and the principle of prior appropriation were not difficult to apply. The water supply was observable and the amount not previously appropriated was measurable. Knowledge of its permanency was available. Such is not the the case where regulations must be applied to ground-water sources. The majority of present desert-land entries rely on underground reservoirs as the source of supply.

In localized areas, there have been intensive activities in exploring for ground water. This has resulted in an unusually large number of desert-land applications. In some areas, sources of ground water have been found on patented lands resulting in the filing of a number of applications on the public domain. In other areas, local residents and speculators have filed applications based on purported private groundwater studies.

Even in areas where ground water has been discovered to irrigate one entry, for example, no information is available as to the total supply. When such areas are in localities where there is a vast acreage which is suitable for irrigation farming, a serious problem is presented as to how many desert-land entries may be allowed without serious depletion of ground-water sources for adjoining developed lands.

In selected cases, the Bureau has issued special land-use permits to explore for water, without breaking or disturbing the land until an adequate showing of water is made. While issuance of special land-use permits insures that a given applicant can make a showing of water, it does not furnish in all cases conclusive evidence of the total water supply.

During the year the Bureau sought procedures to help equate the rights of present water users with the demand of new desert-land applicants seeking to use water from what may be the same inadequate sources. Better knowledge of underground reservoirs plus more definitive laws on water appropriation are necessary for adequate protection of underground water supplies and proper agricultural development of desert areas.

Small Tracts

The demand for small tracts far exceeds the land presently classified and available for the purpose. While it is known that there are a number of areas where there are small-tract possibilities, lack of funds and personnel do not permit a general reconnaissance to determine the approximate location of the areas or to make classifications and surveys necessary for their disposal.

Several hundred tracts were made available, however, in openings in Wisconsin, Wyoming, Florida, Alabama, Montana, California, Nevada, New Mexico, Washington, and Alaska.

Other Disposals

Under a program to place more land under private management, isolated parcels of public lands not adapted to homestead application are sold usually to adjoining landowners. Extensive exchanges with States, notably New Mexico and Montana, have resulted in the consolidation of both State and Federal holdings.

Although little of the remaining public domain is suited for agricultural development, a number of applications under the homestead acts are approved during the course of the year.

River Basins

Field studies in the Arkansas-White-Red River Basin continued throughout the year. The Missouri River Basin studies also showed considerable advancement. Approximately 1,016,049 acres of land were classified.

Area studies of the river-basin type, with resultant classification of remaining public domain, greatly facilitate ultimate management or disposition of lands and where individual applications are made for specific tracts make possible rapid and efficient lease or disposal.

In total the Bureau classified during the year over a million acres in basin studies and major area classifications. The Bureau of Land Management also examined and classified 1,800,000 acres in small area and individual case studies.

Major Disposals

During the year, the total disposition of public lands through sales, exchanges, and transfers amounted to 364,000 acres. In addition, a total of 2,300,000 acres of public lands were withdrawn for military, atomic-energy, forest, or other Federal programs. Approximately 1,400,000 acres of withdrawals were revoked.

Protection of Antiquities

Because of the investigations of various universities and other institutions in archeological studies, particularly in the Southwest, Utah, and Colorado, violations of the Antiquities Act have been reported in increasing numbers. The policing of these areas by range managers and the investigations of violations and alleged violations have created heavy obligations which are not normally accounted for in the allocation of funds.

An agreement with the National Park Service during the year, particularly with reference to the management of recreational, historical, and archeological sites on Bureau lands, is a major step in developing procedures in the administration and protection of lands valued for esthetic resources.

DIVISION OF ADMINISTRATION

Management Improvement

The management improvement program of the Bureau promulgated in accordance with Public Law 429, 81st Congress, and Executive Order

10072 was continued. This program which has the active interest of the Director is active in all regions and in Washington. Management problems are identified by various review and appraisal techniques, including scheduled reports, scheduled inspection surveys, staff conferences, and the suggestion system.

One of the important aspects of the program is the control exercised over forms, regulations, and procedures which are cleared and coordinated by the Branch of Management Planning. This control results in a substantial percentage of the management improvement effected.

Appreciable progress has been made in the development of the new Manual. The following 36 releases were prepared and issued during the year: Introduction 3: Volume II, Director's Office 4; Volume III, General Index and Tables 3; Volume IV, Administration 16; Volume VII, Engineering 3; Volume VIII, Forestry 7. Assignments have been made covering practically all the additional material necessary to complete this project.

The Bureau's "Management Notes" has been continued, and brings to the attention of personnel major items relating to management, changes in regulations, procedures, instructions, and similar material.

During the year, the program resulted in 72 revisions and amendments of regulations; procedures and methods were processed, and 210 forms and related procedures were reviewed, with 39 forms declared obsolete.

An important improvement was the formulation of the inspection program under Order No. 512. This requires the regular scheduling of inspections of district offices by regional offices and the submission of reports and comments from the regional administrator to the Administrator in order to correct deficiencies developed. The order provides for a coordinated inspection of regions with emphasis on regional offices by teams of three employees from the office of the Administrator. This order also created the Washington Committee for the Review of Field Office Operation.

The incentive awards work of the Bureau continued as one of its important management tools. During the year the committee considered 123 new suggestions, and 9 cases were reopened. It also considered 21 recommendations for service honor awards, 12 recommendations for salary increases for superior accomplishment, and 16 recommendations for outstanding performance. The committee approved the payment of awards in 35 suggestion cases. It approved salary increases for superior accomplishment in 11 cases, 10 meritorious service honor awards, and 9 commendable service honor awards. It approved 7 outstanding performance ratings out of the 16 submitted. It approved and recommended to the Department one distinguished honor award which was adopted.

Records Management

Good progress was made in improving the operational procedures of the Branch of Records Management and in establishing a better records management program.

A management firm completed a study of the public-land record requirements as of July 31, 1952, and submitted their recommendations for improvement. In addition to this, the branch also spent considerable time in exploring alternate methods and procedures to find the best system for the improvement of the records system.

With the assistance of the records management staff of the General Services Administration, a survey of noncurrent records activities was conducted for the purpose of analyzing the records and preparing retention and disposition schedules. As a result, schedules covering 80 percent of the Bureau's records were prepared and submitted to the Congress for the necessary legal authority for disposition. This authority was given on June 17, 1953. (See H. Rept. 572, 83d Cong., 1st sess.)

The survey also resulted in the transfer of 180 cubic feet of valuable and historic records to the National Archives for indefinite retention, and 810 cubic feet of serial case files were transferred to the Federal Records Center. Plans were also made to transfer another 6,000 cubic feet of serial cases from the Washington office and an undetermined volume from field offices.

Chapters 1 and 5, part 5, volume IV, of the Manual were prepared and released.

Microfilm operations continued at a diminished pace. There were 41,843 plats microfilmed during the year, completing the microfilm program of the Bureau's plats of survey.

There were 106,143 actions taken in satisfying requests for public land information in addition to furnishing 54,549 photostatic copies of the Bureau's official records.

Administrative Services

Careful management and planning of property, equipment, supplies, storage and issue facilities of field offices and the disposal of excess and surplus items not needed for immediate use, resulted in improved property control and utilization. Careful inventory of property and reconciliation with regional records was emphasized, resulting in more accurate property accountability and cost account records.

The Bureau disposed of excess and surplus personal property by sale, donation, etc., to educational and public institutions in the amount of $32,593. Personal property transferred to other agencies amounted to $11,977. In accordance with present property utilization program, the Bureau acquired $23,545 worth of property by transfer from other agencies.

The acquisition of automotive equipment for replacement purposes and additional equipment, augmenting equipment purchased last year, has improved Bureau equipment to the highest standard attained in many years.

The Property Chapter for the Manual covering procedures on property (real and personal) is completed and will be promulgated the first part of the new fiscal year.

Closer scrutiny of requests for supplies and equipment and wider distribution of bids resulted in savings in funds and labor. The use of the Standard Form 44 Purchase Order and the establishment of imprest funds also contributed to greater efficiencies in procurement operations.

Through closer cooperation with the Postmaster General's Office and the Public Buildings Administration, Bureau space requirements in several regions were improved by the acquisition of additional space.

Inquiries answered for general informational material relative to land disposals under the Small Tract and Homestead Acts, totaled 87,981 for the year.

Budget and Finance

During the year the internal-audit staff completed audits of two regions, the first to be performed in accordance with the Budget and Accounting Act of 1950.

In cooperation with representatives of the Department and the General Accounting Office, plans were completed for decentralization of the general ledger to the regional offices and a draft of the manual covering the tentative procedures was prepared. The first installation was to take place as of July 1, 1953, in region I, Portland. Decentralization will follow in other regions.

An audit of the receipts from the O. and C. lands was completed. This revealed that funds had been returned to the Treasury for all charges reimbursable under the O. and C. Act, and an additional $41,000 was distributed to the counties.

The appropriation which was made for road construction in the O. and C. area provided for its reimbursement from timber sales and receipts and this, too, was accomplished during the fiscal year.

Continued study of the Bureau operations permitted handling the increased volume of receipts as well as expenditures without requiring additional personnel.

Personnel

The President's program for full utilization of employees' skills was emphasized to first-line supervisors throughout the year. Results of the Bureau's policy of placing primary responsibility for good personnel management on supervisors at all levels became more apparent and improved supervisor-employee relations were evident.

Operations under decentralized personnel appointing authority which permitted regional administrators to take action with respect to appointments and status changes in positions up to and including grade GS–11 were satisfactory and enabled faster service to operating programs while general professional and clerical staffs were being increased.

Recruitment of young professional foresters, range conservationists, and others was increased due principally to expanded programs in weed control and timber salvage. The caliber of men recruited from colleges continues to be high.

The Bureau pioneered in the management-training program by recruiting a junior management assistant at each of four regional headquarters with very satisfactory results. In addition 3 junior management assistants participated in the program in Washington along with 4 experienced technical employees from the regions.

The Fourth Annual BLM Training Conference was held in September with participation by 45 Bureau employees. Representatives of two colleges who train undergraduates in work related to Bureau programs also attended. This exclusive formal training program of the Bureau is now well established as an important instrument in the development of personnel.

Average employment of all types of employees except district grazing advisers was 1,557. Average employment in the Washington office was 215, and in the regions as follows: Region I, 392; region II, 208; region III, 225; region IV, 221; region V, 155; region VI, 27; region VII, 103; and foreign, 7.

OFFICE OF THE CHIEF COUNSEL

Legislation

The following action was taken by Congress on important items of public-land legislation during the fiscal year ending June 30, 1953:

Eighty-second Congress—House bill 5350.—A bill which amended the Federal Property and Administrative Services Act of 1949, as amended, to provide for disposal by GSA of improved surplus public domain, and return to public domain of unimproved property, etc. (Public Law 522, approved July 12, 1952.)

Eighty-third Congress—House bill 1308.—A bill to liberalize the Color of Title Act by accepting as proof payment of taxes, etc. (Passed House June 15, 1953. Passed Senate in fiscal 1954.)

House bill 1812.—A bill to exempt temporary and certain other employees of the Bureau of Land Management from limitations on holding public-land interests. (Passed House May 5, 1953.)

House bill 1813.—A bill to require the recordation of scrip, lieu selection, and similar rights. (Passed House March 2, 1953.)

House bill 1815.—A bill to amend the Recreation Act to permit disposals for other purposes, etc. (Passed House May 19, 1953.)

House bill 1816.—A bill to repeal certain laws relating to timber and stone on the public domain. (Passed House March 2, 1953.)

House bill 2512.—A bill to amend the Small Tract Act to provide for leasing of unsurveyed lands, disposals to corporations and associations, etc. (Passed House May 19, 1953.)

A report of major regulations and other legal matters in the Bureau of Land Management record follows.

Regulations

Regulations were added to supplement the withdrawal procedure authorized by Executive Order No. 10355 of May 26, 1952, to provide for public notice and hearings in advance of the making of withdrawals, and to prevent public land from passing from Federal control during the period which elapses between the time of the filing by a Federal agency of a request for a withdrawal and until a public-land order withdrawing the land has been signed by the Secretary.

Several of the regulations relating to Alaska were revised or amended. Among these was a complete revision of the Alaska coal regulations to make them reasonably similar to the coal regulations for the States, and a revision of the free-use timber-cutting regulations deleting certain text relating to internal administration and adding a new section to restrict the cutting of timber along highways or public roads and along the shores of lakes designated for recreational use.

A new section was added to the small-tract regulations to permit the use of a drawing procedure in connection with offers to lease public land in Alaska in terminated small-tract leases.

The O. and C. timber sale regulations were revised to incorporate modifications which have been made informally either by teletype, memoranda, or some other source, since the issuance of the previous regulations in 1938. They were also amended to permit the sale, without advertising, to the holder of an O. and C. timber-sale contract, of tracts of salvage timber up to 500,000 board-feet where it is not in the interest of the United States to have two timber-sale purchasers operating in the same vicinity. The required period of advertisement was reduced to 1 week for all salvage sales of wind-thrown, insect-damaged, or fire-killed timber.

The general timber regulations were amended to provide that the advertising time for sales of timber valued at $1,000 or less, be 10 days rather than 30 days, and that where the regional administrator finds that a speedy sale is necessary to protect the Government due to the danger of deterioration because of insect and fungus damage or other cause, a sale may be made after advertising for 10 days by posting of notices and 1 publication in a newspaper of general circulation in the county.

The public-sale regulations were amended to authorize the Bureau to consider land-use factors so as to apportion fairly the subdivisions of lands to be sold among preference-right claimants who are unable to agree to a division, and to provide that if equitable considerations dictate, the Bureau may award all of the subdivisions to one claimant.

The right-of-way regulations were amended to delete the language which provided for the exchange of power with private power companies in lieu of the transmission of Government power over their lines; to reserve rights-of-way for reservoirs, dams, and other similar or related works constructed for the development of hydroelectric power or irrigation, or for any other purpose, or combination of purposes; to permit a State or other governmental agency which has no legal power to pay the full value of damages to lands or property of the United States resulting from the construction and use of a right-of-way, to repair all such damages; and to eliminate the detailed common-carrier stipulation for natural-gas pipelines crossing public lands thereby making the provision the same for either oil or natural-gas right-of-way applicants.

The potassium regulations were amended doubling the area that may be held under permit and enabling lessees holding the present maximum leaseable area to acquire additional land under certain conditions, and recasting the acreage-limitation provision on a State rather than on a national basis in order to promote more diligent prospecting in States other than New Mexico.

The oil and gas leasing regulations were amended to provide for cancellation of a lease if, through oversight, it had been issued before final disposal of a prior oil and gas lease application or of a subsequent lease application based on an alleged right of a former lessee.

The private-exchange regulations were amended to make clear that a decision directing publication of notice of a private exchange is not a final determination of any material fact in connection with the exchange.

Footnotes were amended or added to the soldiers' and sailors' homestead regulations to show the termination date of World War II.

Litigation

Several major pieces of litigation were recorded.

Upon the recommendation of the Government the District Court for the District of Columbia dismissed the action entitled "*Clackamas County* v. *McKay*" on the grounds of lack of jurisdiction, inapplicability of mandamus, and failure to join the United States which is a necessary party and which has not consented to be sued. This suit had been brought by Clackamas County to compel the Secretary of the Interior and the Secretary of Agriculture to take action to distribute the controverted O. and C. funds to the counties on the basis of the O. and C. Act. The county has appealed from the district court decision. A similar suit brought by Clackamas County in Oregon was also dismissed.

The Supreme Court denied the petition for writ of certiorari filed by the plaintiff in the case entitled "*Sellas* v. *Kirk*." The lower courts held that the Secretary of the Interior is a necessary party in a suit to contest a decision on a grazing-permit application which had been affirmed by the Secretary and that such suit must be brought in the District of Columbia. The lower courts also held that in this case the granting of the permit on the basis of land and water, pursuant to special rule, is a matter committed to agency discretion.

The District Court for the Territory of Alaska issued a permanent injunction in the case of *United States of America ex rel. Lowell M. Puckett, Regional Administrator, B. L. M.* v. *Gordon H. Morley and Wesley E. Edwards* ordering the defendants enjoined and restrained from removing gravel, minerals, and other surface resources from a mineral location on the outskirts of Anchorage, Alaska, because the land was not open to location under the mining laws because it had been withdrawn and reserved for townsite purposes by Executive order.

Trespass

Each of the regional offices succeeded in reducing by a considerable amount the number of trespass cases on hand and in most cases larger amounts were collected from this type of case than in previous years.

Compliance Actions

The Bureau has been delegated the authority to determine and enforce compliance with the provisions of any instrument of transfer and take other actions necessary, pursuant to the provisions of section 203 (k) (2) of the Federal Property and Administrative Services Act of 1949 with respect to property transferred pursuant to the Surplus Property Act of 1944, as amended and extended (50 U. S .C., Supp. V, App. 1622 (h)), to States, political subdivisions, and instrumentalities thereof, and municipalities, for use as a public park, public recreational area, or historic monument for the benefit of the public. The Bureau makes formal determinations and issues the instruments necessary to accomplish the desired results, based upon reports obtained from the National Park Service which furnishes technical advice concerning compliance with park and historic monument use, and other matters requiring action under the provisions mentioned.

Since the program began in 1948, 43 cases have been processed, involving 27,561 acres of land, 585 buildings, and bringing a return of $1,234,349 to the United States Treasury. During this fiscal year 13 biennial reports setting forth the extent of compliance by the grantees with the terms of the deed were received and reviewed, or were asked for, 3 requests for abrogation of conditions of conveyance were considered by the Bureau, and 2 releases issued involving an additional return of $60,530 to the Government. The National Park Service from time to time makes field trips to the various areas where problems of a technical nature require on-the-spot handling. It is sometimes necessary where legal problems are anticipated that a representative of this Bureau accompany the Park Service representative on such trips.

It is anticipated that the compliance work will continue to grow in quantity and complexity because of the increasing amount of surplus real property which is being made available to the various States and municipalities for park and historic monument purposes under the act, and because of the changes in use of such parcels as their plans and programs develop.

Miscellaneous Legal Work

This office collaborated with the Solicitor's Office and the Atomic Energy Commission to (*a*) devise a satisfactory form for leasing fissionable source materials on lands in oil and gas leases, and (*b*) prevent leasing of coal lands pending their exploration for fissionable materials.

A study was made of the western water laws to determine the extent of the Bureau's obligation to file applications for water rights with State water officials. Findings were submitted to the regions for comment and their determination as to where and what types of water applications need now be filed under State law.

Approval was received from the Federal Power Commission of a mineral lease power-site stipulation to be incorporated in agency regulations.

After a study of the numerous notations required to be put on the tract books it was concluded that mineral surveys of claims for which patent had been denied should be expunged from the tract and plat book records.

It was determined that the right to conduct seismograph operations in the search for oil and gas was limited to rights under Federal leases and could not be exercised on unleased lands.

OFFICE OF INTERNATIONAL COOPERATION

During the fiscal year ending June 30, 1953, there have been increased demands and many specific requests made upon the Bureau of Land Management by the international agencies and the foreign countries for various types of technical assistance.

The Bureau, while continuing, in the Philippine Islands and Egypt, its previous practice of making its contribution of consultation, planning, and the participation of individuals on short-time projects, in 1953 began a phase of the work that called for balanced teams of experts to assume charge of programs and projects in foreign countries on a long-term basis. Teams of technicians have been serving in Paraguay, Egypt, Jordan, Israel, and Iraq. Individual technicians joining such teams are now going for 2-year initial periods. Additional requests for these types of services are pending.

The range of interests being served by the Bureau's technicians involves surveys, consultations, and plans on programs for the development and management of land resources; grazing-land development and management in the semiarid areas of the Near East; cadastral surveying and land records and titles systems; land classification according to use suitabilities, and planned development of conservation and control measures accordingly; tenure reorganization and adjustment for modernizing man-land relationships; and such additional practical matters upon which foreign countries now want aid.

The transition of the Bureau's overseas programs from the earlier phases of the cycle of participation growth and development to the present phase of actually conducting technical activities for several countries in various parts of the world marks certain accomplishments. The broad concepts of land management are becoming known on a worldwide basis. Its various departments of skills and knowledges are being increasingly appreciated. Its personnel are in demand.

And, it is clearly indicated that there is a longtime need for the kinds of technical services the Bureau can render on the part of foreign countries participating in the technical cooperation programs.

The work of the Office of International Cooperation has also developed during the past year certain new services, including the training of foreign government officials in the work of the Bureau and the backstopping of Bureau technicians on duty in other countries. Thus the leaders in land management in other countries are now coming to the Bureau for guidance and training; and the advisory resources of the Bureau are going out to the foreign countries as the Bureau technicians and their foreign counterpart officials are assisted by the backstopping program.

While these new indexes of growth are occurring, there continues the more general nature of activities which were discussed in the last report. Interagency conferences are attended; policies and positions are evolved; decisions on United States Government participation in proposed foreign projects; and evaluations of programs and projects.

A result of the foregoing activities, the Bureau is gaining in knowledge and perspective as its officials and experts get experiences in working on the important land problems of other countries. Personnel on duty in foreign countries or advising foreign government officials often face larger problems and carry more responsibility than they have had opportunity to do at home. The ultimate values of this should be of value to the Bureau and to the Department.

Countries whose government officials interested in land-management activities and land-resources development have visited the Bureau for study, and training for varying periods are as follows: France, Libya, Pakistan, Philippine Islands, Japan, England, Indonesia, Norway, Chile, Southern Rhodesia, Italy, Iraq, Iran, Netherlands, and Finland.

The Bureau contributed leadership to the Sixth International Grasslands Congress, held at State College, Pa., and the Latin American Seminar on Land Problems sponsored jointly by the Government of Brazil and the Food and Agriculture Organization of the United Nations, in Sao Paulo, Brazil.

SUMMARY

A summary of the Bureau of Land Management's major activities for the fiscal year 1953 shows:

Cadastral Engineering

Approximately 1,646,850 acres of land were surveyed or resurveyed. This program included such important and essential work as the identification of lands for the Atomic Energy Commission in the development of uranium deposits; the extension of exterior township boundaries for control in development of mineralized areas; surveys necessary for determination of the boundaries of timbered lands under the jurisdiction of the Bureau for the conduct of the essential salvage operations in Oregon and California, as well as resurveys to establish the boundaries of forest lands under the jurisdiction of this agency in other public-land areas, and surveys necessary for the management and improvement of grazing lands to improve the forage and grazing capacities.

The cadastral program also included the survey of something more than 1,100 small tracts which provide homesites to meet the demand created by population growth in certain localities in Arizona, California, Montana, and Wyoming, and for vacation homesites in those States and Florida. The investigation of accretion areas to determine the ownership thereof, and the survey of islands and omitted areas in Florida, Louisiana, Michigan, Missouri, North Dakota, Utah, and Wisconsin were a part of the program.

The program also included the resurvey of vast areas within reclamation projects such as the Missouri River Basin development, the Colorado-Big Thompson project and the Davis Aqueduct and gateway canal units, as well as the survey of approximately 390 miles involved in the establishment of reservoir boundary and rights-of-way traverses. For the Bureau of Indian Affairs resurveys were executed to accommodate oil and gas leases on the Southern Ute Reservation in Colorado and to determine the boundary of the Mescalero Indian lands in New Mexico.

The field program carried forward in Alaska during the fiscal year 1953 was designed to accommodate the most urgent projects. That program accomplished the survey or resurvey of 12,720 acres of land under the rectangular survey net; the segregation of 50 miles of highway right-of-way resulting in making available some 6,500 acres of land for agricultural and home purposes; the survey of 53 homesites and homesteads, 11 trade and manufacturing sites, 10 headquarters sites, and 2 municipal airports. In addition 447 town lots in 4 townsites were surveyed and a total of 2,877 small tracts were surveyed and made available for development for homesites during the year.

Range Management

Permits and licenses issued to approximately 20,000 operators authorize the grazing annually of 8.7 million head of livestock on the public lands within grazing districts.

Unreserved public lands lying outside of grazing districts occur usually as small tracts scattered among private-land holdings and are leased for grazing under section 15 of the Taylor Grazing Act to over 1,000 livestock operators.

A major transition in programing soil and moisture conservation from a selected area to a watershed basis was initiated in the previous fiscal year. Soil-erosion control and runoff retardation measures have been generally applied on the public lands in keeping with the new approach. In addition, installations on several critical drainages were based on more precise operations planning embodying a system of watershed treatment specifically designed to meet the hydrologic and sedimentation characteristics of the watershed. Examples of these installations are Logan Gulch on Wind River in Wyoming; Willow Creek on Milk River in Montana; and the San Simon Wash in Arizona.

The poisonous rangeweed, halogeton, continues to invade Western rangelands and cause livestock losses. The area of infested public land increased from approximately 1,100,000 acres in fiscal year 1952 to over 1,500,000 acres in fiscal year 1953. Reseeding infested and threatened rangeland to hardy perennial grasses has proved to be the most effective permanent method of control now known.

Well over 200,000 acres have been reseeded and an additional estimated 20,000 acres of seedbed have been prepared for fall seeding. Over 4,000 miles of halogeton infested rights-of-way and over 19,000 acres of spot infestations have been treated with chemical sprays. Technical assistance in evaluating control results is being furnished cooperatively by several land-grant colleges.

Minerals

Oil and gas and other mineral leasing activities of the Bureau continued at a high level during fiscal 1953. Over 16,500 oil and gas offers for leases were filed and over 800 other applications were received. At the end of the fiscal year, there were more than 78,000 oil and gas leases outstanding on the public domain, embracing almost 60 million acres, and over 2,000 oil and gas leases outstanding on acquired lands covering more than 1,800,000 acres. There were 950 leases for other minerals outstanding covering an area of more than 900,000 acres.

Applications for patents on placer and lode claims under the United States mining laws continued at a high level, with 144 applications being received and 61 patents issued.

Of outstanding importance during fiscal 1953 was the increased interest in and development of minerals in Alaska. A large group have picked the areas of the Wide Bay, Cold Bay, Iniskin Bay, and from Kenai to Homer on the Kenai Peninsula. Another group has picked the Tuxedini Bay area, and several groups are interested in the area north and west of Anchorage. Exploration and drilling has started in the Katalla-Yakataga area. The interest in Alaska is not only in oil and gas but also in coal, for which 12 prospecting permits covering 26,900 acres were issued.

The revenues from royalties, rentals, and filing fees under the Mineral Leasing Act were high during the fiscal year. Out of the total revenue of over $66,800,000 from the various public land source activities, $49,200,000 of that amount was derived from leases issued under the Mineral Leasing Acts. The majority of receipts under the Mineral Leasing Acts were from royalties, rentals, and bonuses for oil and gas leases.

Lands

The tremendous increase in applications for lands—a 50-percent increase over 1952—has even greater meaning when compared to the 1940–45 average. During the war years, the Bureau received annually about 3,000 lands cases. During 1953, the total received amounted to 23,000 cases. Desert-land applications rose spectacularly from 50 per year in the war period to 3,300 in 1953 alone. Applications for homesteads increased from the wartime average of 450 to 1,100 in 1953. Small tracts, increasingly popular, showed demand of about 800 a year from 1940 to 1945, but rising to 13,500 in the past fiscal year.

During the year, the total disposition of public lands through sales, exchanges, and transfers amounted to 364,000 acres. In addition, a total of 2,300,000 acres of public lands were withdrawn for military, atomic energy, forest, or other Federal programs. Approximately 1,400,000 acres of withdrawals were revoked.

At the request of the Secretary of the Interior, a review was begun of those areas of public land in Alaska now withdrawn from entry, especially those close to growing communities. Efforts are being made to reduce withdrawals to a minimum, to place the maximum amount of resources available for Alaska's expanding economy.

Forestry

Public-domain forests and woodlands under the jurisdiction of the Bureau of Land Management are, for the most part, lands found unsuitable for homesteading, or disposal under other land laws. The Bureau also administers the immensely valuable revested and reconveyed Oregon and California Railroad grant and Coos Bay Wagon Road grant lands. In addition, vast areas of forest and wood land in Alaska are a Bureau responsibility.

The O. and C. and C. B. W. R. grant areas are comprised of 2,610,867 acres of timberlands in western Oregon. Bureau foresters have estimated that these lands support a total volume of 60 billion board-feet of high-quality, old-growth Douglas fir and associated species, and have a sustained-yield capacity of 900 million board-feet per year.

The total area of commercial forest on public-domain lands in the United States is estimated to be 4,401,958 acres. The estimated volume of timber on these lands is 20,157 million board-feet with an annual allowable cut of 237 million board-feet. In addition, there are approximately 30 million acres of public-domain woodland supporting an estimated equivalent of 42,589 million board-feet of wood material with a possible sustained-yield capacity of 259 million board-feet per year.

In Alaska, the Bureau is responsible for 40 million acres of commercial forestland and 85 million acres of woodland supporting, respectively, an estimated 180 billion and 170 billion board-feet of forest products. These lands have an estimated combined total sustained-yield capacity of 2,300 million board-feet each year.

The total volume of windthrown timber on the O. and C. lands alone is estimated at 3 billion board-feet. On other lands there is probably twice as much more.

The only practical human means of controlling or minimizing the beetle attack is by logging the dead, down, and damaged timber and removing it from the forest so that it cannot serve as a breeding ground for the beetles. This job is being done as rapidly as funds for access roads and the necessary personnel allow. During fiscal year 1953, 268,046,000 board-feet of salvage timber were sold for $5,640,937. This salvage job is now estimated to be about 29 percent complete.

Thus far, on the average, it has been possible to market only about half of the estimated 900 million board-feet sustained-yield capacity of the O. and C. and C. B. W. R. lands because of the shortage of personnel and lack of access roads. In fiscal year 1953, a total of 626 million board-feet of timber, including salvage, were sold for $13,900,000—the largest volume and highest sales value of timber offered for sale in any previous year in the history of the O. and C. lands.

The forest-management program being developed for the nearly 44½ million acres of public-domain commercial-forest lands in the United States and Alaska is similar to objectives to the O. and C. program, though, as yet, much less intensive. Returns to the Treasury from the sales of sawtimber and other forest products from the public-domain forests and woodlands have consistently been greater than the cost of management. In fiscal year 1953, 92 million board-feet of forest products were sold for $1,114,000, over 2 times the cost of administration.

Successful management of the Bureau's vast natural resources is dependent on its ability to furnish adequate protection from fire, insects, and disease.

BUREAU OF MINES

John J. Forbes, Director

FOREWORD

Assumption of new responsibility for preventing coal-mine disasters, development of a method for producing ferromanganese from steel-furnace slag to a point where industry adopted it on a semiworks basis, and conclusion of demonstration-scale research on producing synthetic liquid fuels from coal highlighted Bureau of Mines activities during fiscal year 1953.

Last year the Bureau operated for the first time under the Federal Coal-Mine Safety Act of July 1952 (Public Law 552, 82d Cong.), which authorizes Federal coal-mine inspectors to act to prevent major disasters in mines regularly employing 15 men or more underground. Excellent cooperation from State mining departments and the coal-mining industry and prompt, diligent execution of the act's provisions by Bureau inspectors made this first year one that promises steady and rapid improvement in coal-mine safety. Although more than 6,000 regular and check inspections of mines subject to the new law were made during the year, only 53 mines were affected by orders requiring withdrawal of men from areas where imminent danger of disaster or violations of the law were found.

Four States took advantage, during the year, of the act's provision for joint State-Federal enforcement, and 28 of the regular inspections of larger mines were made jointly by State and Federal coal-mine inspectors. Only 1 major disaster—1 killing 5 or more men—occurred during the year. This was a coal-dust explosion, set off by black blasting powder at a mine that had obtained a court injunction barring issuance of a Bureau withdrawal order. The explosion, which killed 5 men, happened the day before the Bureau was notified that the injunction had been dismissed.

Since the new act permits control only of conditions that may cause a major disaster, and these only in the larger mines, the Bureau continued to rely on a varied program of research, investigation, and training to promote safety and health in the mineral industries. Its inspectors visited small mines and strip mines, recommending voluntary elimination of hazards. They assisted in rescue and recovery operations after disasters, investigated coal-mine fatalities, and conducted accident-prevention courses and classes in first-aid and mine rescue procedures. Thousands of samples of mine atmosphere, gas and dust were analyzed, electrical and diesel equipment was tested for safe use underground, and research was done and advice given to operators on mine-ventilation problems and roof-bolting techniques Work continued on flood prevention in the Pennsylvania anthracite region and control of fires in inactive coal deposits.

The Bureau's minerals-development program was pursued actively during the year. Four years of intensive research culminated in development by the Bureau of an economic process for reclaiming urgently needed manganese from steel-furnace slags. Further research indicated that this process, already adopted by industry on a semicommercial scale, can be used also to beneficiate low-grade ores from large deposits in Aroostook County, Maine. Using the technique on slags alone can greatly increase United States self-sufficiency in manganese.

Research on other metals produced a low-cost method of making ferronickel from low-grade nickel silicate ores, a commercial low-temperature process for refining Cuban oxide to metal, and a process for making metal granules from powdered cobalt. The Bureau also investigated deposits of iron ore, molybdenum, tungsten, thorium, and uranium and conducted research on aluminum, chromium, copper, lead, and zinc. It developed methods for recovering beryllium ores from domestic deposits, made progress toward increasing supplies of columbium and tantalum, and furnished the Nation's entire supply of zirconium and hafnium, both in demand for atomic-energy uses. To help supply defense requirements, the Bureau resumed production of titanium and expanded long-range research to develop means of recovering alumina from domestic materials.

Research advanced on synthetic mica, mullite, and talc block, and problems of asbestos and sulfur supply were attacked. In addition, the Bureau continued physical science studies to increase mining efficiency and cooperated in the Department's program for developing river-basin resources of the United States.

The Bureau concluded operations in coal-to-oil demonstration plants at Louisiana, Mo., at the end of the fiscal year, having reached a stage where operations on this scale no longer yielded sufficient data to justify their expense. Laboratory and pilot-plant studies will continue to improve known processes and develop new ones. Laboratory research during the last year developed improved catalysts that were used to show the chemical feasibility of producing high-quality gasoline from coal in a single hydrogenation step. Research on production of oil from oil shale moved ahead, and stable, high-octane gasoline was made on a bench scale by high-temperature retorting of entrained oil-shale particles. Gas-combustion retorting of oil shale was begun on a scale of 300 tons per day during the year at Rifle, Colo., where further improvements were made in shale mining.

Coal research included tests of several continuous-mining machines, further experiments with an imported coal planer for use in bituminous-coal mines, and development of improved methods for increasing production and recovery of anthracite. Investigation of known minable reserves of coking coal continued in five States during the year; and several studies were made, and reports published, on preparation and carbonizing properties of various coals. Improvements were made in a commercial fluidized-bed lignite drier developed by the Bureau in cooperation with a Texas power company; design of the first fluidized carbonizer was completed, and arrangements were made for construction and testing. The Bureau continued to gather and analyze statistical and economic data on coal, coke, and coal chemicals for use in planning research and forecasting defense requirements. Coal sampling and analysis required for Federal coal purchase and general research were carried on throughout the year, and advice on boiler-water conditioning and air and stream pollution was given cities, private firms, and other Federal agencies.

A cooperative field study of radioactive minerals in Colorado also supplied information of value to the petroleum and natural-gas industries. Data were compiled on oilfields in the Missouri River Basin, and reports were published on petroleum-engineering and secondary-recovery studies in key oilfields in seven States. Research on petroleum chemistry and refining advanced during the year, and monthly exchange testing of motor fuels continued, as did statistical and economic studies of the petroleum and natural-gas industries. Record production of helium was attained.

Nearly 1,500 tests were made of permissible and special explosives and hazardous chemicals, and explosive characteristics of 80 different dusts were studied.

Throughout the year, the Bureau conducted extensive foreign activities, collecting information on foreign minerals, extending technologic aid to friendly nations, and training students from these nations in American techniques.

SAFETY AND HEALTH ACTIVITIES

Approval of the Federal Coal-Mine Safety Act (Public Law 552, 82d Cong.) was the outstanding development of fiscal year 1953 affecting the Bureau's efforts to promote greater safety and more healthful working conditions in the mineral industries. This act directs the Bureau to require compliance with specific provisions designed to prevent disasters in certain underground coal mines. New procedures for inspecting the mines affected were developed with a minimum of dislocation of coal-mine inspection under voluntary provisions of the Federal Coal-Mine Inspection Act of 1941, incorporated in the new law as a means of obtaining precautions against ordinary accidents. At the same time, the Bureau continued research and investigations to determine hazards in the mines and plants of the mineral industries and develop ways to combat them, and training and demonstrations to spread the knowledge gained throughout the industries.

Coal-mine inspection.—The Federal Coal-Mine Safety Act consists of title I, the 1941 law with slight changes, and title II, containing mandatory provisions for preventing explosions, fires, inundations, and man-trip or man-hoist accidents in mines regularly employing 15 or more men underground. It provides for joint State-Federal enforcement of title II in States entering into cooperative agreements with the Bureau.

During the year, 3,056 regular inspections of title II mines were made, 28 of them jointly by State and Federal inspectors. Also, 5 special inspections were made in connection with imminent danger and 3,276 regarding violations not involving imminent danger. Inspectors observed 7,540 violations of title II, but many of these were corrected immediately. They issued 3,990 original notices setting a reasonable time for abating dangers, 1,592 notices granting time extensions, and 3,669 notices certifying that dangers had been totally abated.

During the year, 106 orders for withdrawal of men were issued at 50 mines, 10 at 8 mines under the imminent-danger clause, and 96 at 42 mines for failure to abate violations within a reasonable time. (The number of orders exceeds the number of mines because each area of imminent danger or each unabated violation requires a separate order.) In addition, 48 orders were issued classifying mines as gassy. This does not mean, however, that only 48 title II mines are gassy, as the law places in that category all mines that on its effective date were classed gassy or gaseous by the State or were being operated as gassy.

The act provides for administrative and judicial review of orders, appeal being first to the Director of the Bureau of Mines, then to the Federal Coal-Mine Safety Board of Review, an independent agency reporting directly to the President, or directly to the Board, then to the United States Court of Appeals, and finally to the United States Supreme Court. An operator in a State having a cooperative agreement must, and one in any State may, appeal first to the Board of Review.

While carrying out the duties imposed by title II, the Bureau did not neglect those continued by title I. Besides using the Federal Mine Safety Code for Bituminous-Coal and Lignite Mines of the United States or the Safety Standards for Anthracite Mines, whichever was applicable, as a standard for recognizing hazards not covered by title II found in larger mines, the Bureau made 4,091 inspections of title I mines, including 390 strip mines.

During the year, the Bureau had 223 coal-mine inspectors, besides supporting personnel. To increase effective administration of title II during the last 2¼ months of the fiscal year, Congress authorized employment of 50 additional coal-mine inspectors, 12 mining engineers, 1 electrical engineer, and 10 electrical inspectors.

During the year, Bureau inspectors investigated 475 individual coal-mine fatalities and 1 major disaster, a coal-dust explosion, ignited by black blasting powder, that took 5 lives. The operator of the mine had obtained an injunction to prevent enforcement of the ban on storing, transporting, or using black blasting powder underground in title II mines, and the explosion occurred on the day before the Bureau was notified of dissolution of the injunction.

The downward trend of coal-mine fatalities and fatality rates, evident since Federal inspection began, continued. Preliminary reports show 546 fatalities, or 0.84 per million man-hours, in calendar year 1952, compared with 585, or 0.90 per million man-hours, in 1949, the previous low. From July 1, 1952, through June 30, 1953, there were 472 fatalities in the Nation's coal mines, or 0.76 per million man-hours.

Work on primary hazards.—Elimination of injuries due to falls of rock and coal and to haulage accidents was emphasized in the Bureau's safety research and training programs; together, they caused 85 percent of the fatalities and 50 percent of the nonfatal injuries during 1952. Roof bolting, introduced by the Bureau to the coal-mining industry in 1948, was used in 620 coal and 126 noncoal mines by the close of the fiscal year. Besides conducting fundamental research on the principles underlying this method of roof support and counseling operators in its application, the Bureau conducted cooperative tests of other methods of roof control in both anthracite and bituminous-coal mines. Yielding props, steel props, concrete sets, and wooden sets were among the types of supports tested. Staff members conferred on roof-control problems with officials of State mining departments and mining companies and regularly investigated roof-bolt installations in all districts, submitting reports to operators, State mine inspectors, and the Bureau.

During calendar year 1952, fatalities due to falls of rock and coal were at the rate of 0.44 per million man-hours, compared with 0.55

per million man-hours in 1948. It is estimated that only about 20 percent of the potentialities of roof bolting as a coal-mine safety measure is being realized.

In a vigorous attack upon haulage accidents, which in the past have caused about 25 percent of all coal-mine fatalities, transportation facilities, practices, and installations were studied intensively. The findings are presented to the industry through motion pictures and reports.

Bureau personnel conducting the Bureau's short roof-control and haulage-safety courses, each of which normally is presented in a half-hour lecture and discussion after a coal-mine inspection, use specially prepared training films to drive home their points. Through June 1953, 195,215 men had attended the roof-control lectures and 111,561, those on haulage safety.

Tests of equipment.—Tests of electrically operated machinery and equipment resulted in approval of 86 complete units of various types as permissible for safe use in coal mines. A 10-ton diesel mine locomotive and a diesel-electric shuttle car also were approved as permissible, after meeting requirements more rigid than those imposed in many countries where use of diesel equipment is standard; the locomotive is being used in a Mexican coal mine and the shuttle cars in noncoal mines in this country.

Special investigations were continued for the Navy Department on electrical fire and explosion hazards on vessels and aircraft.

Health.—The Bureau studied and evaluated conditions affecting health in the mineral industries, providing information on mine ventilation and control of harmful gases and dusts and testing respiratory protective equipment.

Nearly 13,000 samples of coal-mine air and 600 from other sources were analyzed. Most of the samples were collected during regular coal-mine inspections. Others were taken during recovery operations after mine fires and explosions, during investigations of toxic and flammable gas hazards in mines, tunnels, and plants, and during laboratory studies pertinent to the mineral industries and the armed services.

Reports were prepared for the Bureau of Ships covering seven materials tested during the year as part of a study to determine the nature and quantity of toxic gases produced by thermal decomposition of plastics.

Air samples were analyzed for the Pennsylvania State police to determine the effect of using unvented, oil-burning, space-heating equipment in a building at New Brighton, and for a local of the United Mine Workers of America to find out if carbon tetrachloride vapors generated in float-sink testing to check the performance of a coal-preparation plant constituted a health hazard. Other tests and studies related to an explosion in an empty oil barge from spontaneous heating of iron and sulfur scale, identification of flammable vapors found in basements at Altoona, Pa., and the accuracy of laboratory determinations of small concentrations of methane.

More than 1,300 dust samples were analyzed. For the Army Signal Corps, about 500 quantitative spectrographic determinations of rare elements in coal ash and other materials were made.

Approvals were granted for 15 dust collectors and drills with integral dust collectors and 5 extensions of approval to cover modifications of equipment. Four approvals and 42 extensions of approvals on respiratory protective devices included 1 on a chlorine gas mask, 1 on a dust respirator, and 2 on chemical cartridge respirators.

Accident analysis.—Collection of accident statistics, except those on industrial use of explosives and injuries in the petroleum and natural-gas industries, was completely decentralized to regional offices during the year. Concentrating on assembling and analyzing data, the Washington staff made publications on injury experience in the mineral industries more current. Besides 12 reports on fatal and nonfatal injuries at coal mines, a bulletin showing the safety record of coal mines in 1949 was completed, including hitherto unpublished statistics and analyses from 1943, as was another—the first since 1943—showing injury experience in the coking industry.

The national safety competition was conducted for the 28th year and the national sand and gravel competition for the third. Cooperation also was given on safety contests sponsored by the National Slag Association, National Lime Association, National Sand and Gravel Association, and National Crushed Stone Association. A record total of 1,028 plants enrolled in the various competitions, and injury rates at competing plants continued to improve.

Safety training.—The Bureau did not relax its safety-training programs, many of which date back to its establishment 43 years ago. By the end of the fiscal year, 97,945 men had completed a 20-hour coal-mine accident-prevention course for miners introduced in January 1947, and 17,911 had completed a 40-hour course for coal-mine supervisors and aspirants for supervisory positions. Both courses are conducted by coal-mine-inspection personnel.

Exactly 501 mining officials attended classes in metal-mine accident prevention during the year, and 65 petroleum-industry workers in Texas and Canada were given safety training. Progress was made in preparing an accident-prevention course for workers in mills, smelters, and refineries.

During the year, 38,359 employees of the mining and allied industries were trained in first-aid and mine rescue procedures, bringing the total trained since 1910 to 1,880,400. With training of 721 instructors, 19,742 persons have been qualified to teach the Bureau's first-aid course. Certificates were awarded to 71 mines and plants all of whose employees had been trained in first aid.

Bureau personnel assisted in 45 first-aid and mine rescue contests in 9 States; 590 teams participated, before audiences estimated at 65,700.

Bureau safety representatives demonstrated the flammability of gasoline vapors before 35,556 persons and the explosibility of other mineral substances before 34,556. Training films made by the Bureau—not to be confused with films in the loan library—were shown 1,047 times. Depicting safe operating methods in coal and noncoal mines and on oil-drilling rigs, as well as first-aid training methods, they were seen by 53,706 persons, over 15,000 more than the previous year.

Investigative work.—During the year the Bureau investigated 22 mine explosions resulting in 19 fatalities and injuries to 28 and 39 mine fires resulting in 8 fatalities and injuries to 10. Two of the explosions, 1 in a coal mine and 1 in a metal mine, were major disasters—single accidents causing 5 or more fatalities—causing 10 fatalities and injuries to 1 person.

Accidents from roof falls, premature blasts, explosions in buildings, asphyxiation, and other causes reported to the Bureau during the year totaled 360; in these 365 lives were lost and 113 persons injured. Two of these were major disasters, 1 a stone quarry where 5 lives were lost, the other at a powder plant, where 12 lives were lost and 18 persons injured. Thorough investigations were made in many instances to determine causes and recommend steps to prevent recurrence.

In cooperation with State officials, Bureau officials made studies in noncoal mines using diesel equipment; to the close of the year, assistance had been given 73 times in 23 States where diesel trucks, loaders, bulldozers, drill jumbos, or locomotives are used.

Anthracite flood prevention.—The study of barrier pillars in the anthracite region of Pennsylvania, completed during the year, showed the folly of depending upon them to withstand water pressure. Studies of water-surface infiltration as related to pumping loads in the Wyoming Basin of the northern field and the western middle field were completed, and a similar one on the southern field is under way.

Progress was made in a study to find out which alloys will best resist corrosion from acid mine water, as a basis for recommendations for equipping large pumping plants. Two emergency pumping plants and a temporary one are being designed in connection with a pending engineering report on measures to solve the anthracite mine-water problem.

Estimates for a proposed tunnel between Conowingo, Md., and Scranton, Pa., were broken into sections to permit temporary relief of the Lackawanna Basin before the entire project could be completed. Diamond-drill cores were taken along an alternate tunnel route from Conowingo to Middleport, Pa.

Preliminary data on the outlook for the anthracite industry are being collected for inclusion in a report on the Bureau's engineering study, which will recommend measures for solving the anthracite mine-water problem.

Control of fires in inactive coal deposits.—During the 5 years ended June 30, 1953, the Bureau has undertaken control of 30 fires in coal deposits not now mined. Thirteen have been controlled on the public domain in Colorado, New Mexico, and Wyoming and 14 on private property in Pennsylvania and West Virginia. Over 190 million tons of bituminous coal and anthracite has been saved from destruction by fire, and an additional 100 million tons will be conserved by projects started in fiscal year 1953. At current market prices, this coal, if brought above ground, would have a market value estimated at $900 million. All of this has been accomplished at an estimated cost of less than 1 cent a ton.

The Bureau has records of 130 additional coal-bed fires burning in Wyoming, Colorado, New Mexico, and Utah. Only preliminary examinations have been made of most of them. Some are on Federal, some on State, and some on private land. Surveys have been made of several of the larger ones to pave the way for attacking them as weather and funds permit.

MINERAL DEVELOPMENT

To assure the United States enough raw materials for current and future needs, the Bureau of Mines conducted intensive research on metals and minerals last year. In laboratories, in pilot and demonstration plants, and at field stations throughout the Nation, its studies emphasized materials still in short supply but essential to our defense and nuclear-energy programs.

For the first time the Bureau formulated a comprehensive program covering its immediate emergency and long-range objectives in the entire field of metals and minerals. This program, based upon all available information concerning supply, technology, and utilization of every important mineral commodity, will be kept up-to-date by annual revisions. It will afford a fully documented basis for charting the Bureau's work in this field, supplemented by proper consideration of other factors.

During the fiscal year the Bureau continued to advise other Federal agencies concerned with mineral resources problems. Its technical personnel served on field teams examining mines and prospects and testing ores to evaluate properties for which financial assistance was sought from the Defense Minerals Exploration Administration and the Defense Materials Procurement Agency. Comprehensive surveys were made for the National Security Resources Board on copper, manganese, iron, and steel scrap. At the same time, the Bureau continued to provide basic information and technologic guidance for the Munitions Board, the Emergency Procurement Service, the National Production Authority, and other agencies.

Ferrous metals and alloys.—The Bureau made important advances during the fiscal year in all phases of its top-priority program to develop domestic sources of manganese—an essential element in steelmaking. At Pittsburgh, Pa., the Bureau's process for reclaiming manganese from open-hearth steel-furnace slags was proved technically feasible, and preliminary experiments indicated that the same process can be used to beneficiate low-grade ores from Aroostook County, Maine. Early in 1953 a private firm began construction of a semicommercial plant for treating slags by this process.

Silicomanganese produced from rhodonite material at the Bureau's Albany, Oreg., laboratory compared favorably with the present commercial product in open-hearth furnace tests. At Minneapolis, Minn., a new pilot plant was completed and began operating during the fiscal year, using a sulfatizing process to treat low-grade ores from the extensive manganiferous deposits of the Cuyuna range. An acceptable ferromanganese product was made at the Bureau's Boulder City, Nev., plant, where low-grade ore from Artillery Peak, Ariz., was concentrated by flotation, then leached by a Bureau-developed dithionate process. Because the equipment at Boulder City can be adjusted easily for test runs on different beneficiation processes, the Bureau plans to use it to develop or perfect methods for treating other low-grade ores.

Continued shortages of cobalt and nickel spurred research on recovery of these metals from domestic ores. Besides perfecting a low-cost process for producing ferronickel from low-grade nickel silicate ores at Riddle Mountain, Oreg., the Bureau produced this alloy experimentally from lateritic ores. In the course of a project to develop means of recovering valuable minerals from laterite and serpentine in the Levisa area in Cuba, the Bureau developed a commercial low-temperature process for refining Cuban oxide to metal. Other research resulted in development of a method for producing metal granules from powdered cobalt.

Seeking effective ways of utilizing the Nation's plentiful low-grade iron ores, the Bureau perfected a method of agglomerating slime concentrates into a suitable furnace product. Bureau engineers also increased known reserves of iron ore through investigations in the Birmingham Basin of Alabama and in the Klukwan deposit near Haines, Alaska.

After devising a process for making cold, ductile metal from electrolytic chromium, Bureau metallurgists began looking for ways to produce still purer metal. Other goals sought were economic production of chromium alloys from offgrade domestic ores and a suitable chromite agglomerate feed for producing standard high-carbon ferrochrome from domestic ore.

In search of new sources of ferroalloy metals essential to the production of special-purpose steels, the Bureau investigated molybdenum deposits in Alaska and tungsten deposits in Alaska, the Far West, and New England. Research was conducted on the production and use of pure molybdenum metal. Bureau engineers made progress in seeking substitutes for manganese in steel manufacture, improving present methods for adding some elements to and removing others from the bath of the open-hearth furnace, and determining effects of various elements on the hot-working characteristics of steel. Excellent results were obtained in the development of high-damping alloys.

Base metals.—With copper in short supply, the Bureau intensified its efforts to discover an economic method of treating the known large reserves of low-grade oxidized copper ores by continued research and testing of a sulfatizing and leaching process.

Cooperative research with the Geological Survey showed that resistivity measurements could locate accurately the buried geological structures that contain many zinc-lead ore bodies in the Tri-State district.

Research on recovery of valuable metals from scrap progressed rapidly; the Bureau developed a vacuum-leaching method that can be used either to recover aluminum from scrap alloys or to produce it from such primary raw materials as high-alumina clays. Experiments are continuing on recovery of zinc from galvanizing residues by electrolysis and centrifugation, and equipment and techniques are being developed for testing selective oxidation and ion-exchange methods of secondary metal recovery.

During the year the Bureau continued to maintain the Leadville drainage tunnel, which already has made possible some production of lead and zinc from the formerly flooded ground near Leadville, Colo.

Rare and precious metals.—Under a contract with the Atomic Energy Commission, the Bureau of Mines continued to aid in the search for fissionable elements, drilling and sampling more than 27 uranium and thorium deposits. The results encouraged several private firms to begin uranium-thorium mining. The Bureau's diamond-drilling and laboratory studies, made in cooperation with AEC and the Geological Survey, determined the feasibility of obtaining uranium from lignite beds in the Dakotas and from oil shales in Tennessee; fuel obtained from these enormous formations could help pay the costs of mining and separating the small amounts of uranium they contain. Cooperating further with AEC, the Bureau helped to test and evaluate over 7,000 samples of ore believed to contain uranium.

Working to increase domestic production of the strategic metal, beryllium, the Bureau developed mechanical methods for recovering its ores from deposits in New England, South Dakota, and North Carolina.

Progress was made toward increasing supplies of columbium and tantalum, both indispensable in making high-temperature alloys for jet-aircraft engines. The Bureau hopes to reduce United States dependence upon foreign sources, which provide over 99 percent of its supply of these metals, by devising means of recovering them from bauxite deposits, as a byproduct from pegmatite mines, and from western placer-dredging operations.

The Nation's entire supply of zirconium and hafnium, both useful metals in the atomic energy field, has been produced in the Bureau's Electrodevelopment Laboratory at Albany, Oreg., by Bureau-developed techniques. Much of the zirconium furnished the Atomic Energy Commission was used in constructing the first atomic-powered submarine.

The Bureau conducted laboratory and field investigations during the year to develop new supplies of germanium and selenium. Both metals are used extensively in producing electronic equipment for defense.

Light metals.—Expanding its long-range program to develop methods of recovering alumina from domestic aluminum silicate materials, the Bureau operated the Laramie, Wyo., alumina plant on a demonstration scale during the year. This plant began operating as a unit late in May 1953 and produced approximately 15 tons of alumina from anorthosite rock and limestone. The information obtained in its operation will be used in evaluating other raw materials as sources of aluminum.

Experiments continued also on direct carbon reduction of aluminum ores in electric furnaces. Earlier Bureau research resulted in establishment in Oregon of a commercial plant which uses this method to produce aluminum-silicon alloys, but the Bureau is still working to improve operating techniques and determine the grade and variety of alloys that can be produced. Bureau metallurgists also sought means of beneficiating offgrade bauxites containing excessive silica or iron and worked on methods of recovering and utilizing byproduct minerals containing iron, titanium, and columbium that are found in Arkansas bauxite.

The Bureau devoted much research to titanium during the year. Metallurgists worked to develop better techniques for fabricating this versatile metal. They studied its performance under carefully controlled conditions to gain better knowledge of its properties, alloys, and compounds. Several reports of investigations were published. One told of a Bureau-developed process that recovers high-grade titania, iron, and salable byproducts from low-grade titaniferous ores. Others discussed the chemical and galvanic corrosion properties of titanium metal or described techniques for improving the quality of titanium sponge and eliminating difficulties in its production.

Commercial production of ductile titanium, based on modifications of a Bureau process, is expanding, but there still is not enough metal to meet defense requirements. To help relieve this situation, in April 1953 the Bureau of Mines entered into an agreement with the Defense Materials Procurement Agency under which it will endeavor to produce at least 360,000 pounds of titanium metal at a rate of 1,000 to 1,400 pounds a day.

Ceramic and fertilizer materials.—At the Bureau's Norris, Tenn., laboratory, further progress was made in developing an inexpensive method of fabricating synthetic mica into a machinable mica ceramic. By proving that hot-pressed synthetic mica is comparable to the best commercial ceramic dielectrics, the Bureau stimulated private industry's interest in this material as a matrix for bonding abrasives and as a mica ceramic for jet engines. Besides conducting crystallization experiments showing that the quality of synthetic mica could be improved by decreasing its fluorine content, the Bureau made progress toward developing testing techniques that will show the relation between the visual and electrical properties of natural mica and the amount of certain impurities it contains.

Advances in Bureau research on synthetic mullite have assured the United States of self-sufficiency in mullite-forming refractory materials at a cost no greater than that of imported Indian kyanite. This work has shown that low-iron, siliceous bauxite with domestic kaolin or silica may be used to produce mullite grain meeting many industry requirements. Bayer-process alumina, combined with silica, was used to produce a high-quality mullite for special applications.

Research at Norris also contributed to development of successful methods of forming reconstituted talc block by chemical bonding under high pressures and temperatures. Laboratory tests, which indicated that the performance of this material as a high-frequency insulator equals or exceeds that of natural talc block, will be confirmed by service tests in electronic tubes.

The Bureau began a comprehensive survey of the production, resources, and markets for ceramic materials of the Pacific Northwest during the fiscal year. Supplemented by laboratory investigations, this will enable the Bureau to evaluate the commercial potentialities of ceramics for specific needs in several areas of the continental United States and Alaska.

Construction and chemical materials.—Attacking the asbestos-supply problems of the United States, the Bureau of Mines examined several prospects and prepared to intensify the search in more promising areas. Research was begun on the possibility of beneficiating high-iron chrysotile asbestos for nonferrous uses, and preliminary investigations of methods for producing synthetic asbestiform materials promised to develop adequate substitutes for natural asbestos.

Seeking hard materials that can withstand high temperatures to meet requirements of jet-aircraft manufactures and nuclear-energy installations, the Bureau prepared and tested various carbides, borides, and nitrides. It also collaborated in an investigation to determine whether fused-alumina abrasives should be stockpiled for future emergencies. This material is now being acquired for the National Stockpile.

The Bureau continued its field and laboratory investigations of mineral construction materials of Alaska during the year and evaluated the suitability of several raw materials for making mineral wool.

Under its sulfur program, the Bureau examined deposits of pyrites and elemental sulfur and compiled information on current supplies and resources available for future development. A comprehensive report was completed on sulfur resources of the Southeastern States, and similar studies were conducted in other areas.

The Bureau studied defense requirements for fluorspar and problems of current supply during the year and examined several domestic fluorspar deposits. Research continued on recovery of byproduct fluorine from phosphate rock.

Miscellaneous research on minerals.—Continuing its physical-science research on metals and minerals, the Bureau gathered fundamental data from which may come future engineering developments for the mineral industries. Investigations were made of the structure and growth mechanisms of synthetic and natural minerals.

To increase safety and efficiency in underground mining and at the same time aid the conservation of natural resources, the Bureau used microseismic recording equipment to measure stresses and strains in rocks in operating mines in Michigan and Ohio. This work has made possible recovery of much ore that would otherwise have been lost. Changed blasting procedures and a corresponding decrease in the percentage of rock bursts occurring during working periods resulted from a Bureau study of rock-burst problems in the copper mines of upper Michigan. During the year, two experimental rooms, similar to the ones developed by the Bureau at Rifle, Colo., were being planned by mining companies in Tennessee and Ohio. These will furnish information that is useful in designing underground mine structures.

The Bureau continued to seek more complete knowledge of the physical properties of mine rock as a basis for predicting more accurately how it will behave during mining operations. Studies were made during the year of the physical properties of shale, limestone, cement, sandstone, and other rocks from 11 States.

Because demands for mineral raw materials have remained high, with corresponding emphasis on exploration and development, the Bureau continued research and performance tests to determine how industrial diamonds can be used most effectively in core drilling.

Serving scientists and engineers who attempt to predict the course of chemical and physical processes from fundamental data, the Bureau measured and correlated the thermodynamic properties of metals and nonmetallic minerals. Research and testing provided basic information on the theory of flotation and on other mineral-dressing techniques. At the request of the Army Corps of Engineers, the Bureau undertook preparation of a manual on design of underground installations in rock.

FUELS AND EXPLOSIVES RESEARCH

Coal and Coal Products

Coal mining and investigations.—During the fiscal year 4 types of American continuous mining machines were tested under varying conditions in bituminous-coal mines in 5 Eastern, Southern, and Midwestern States. Cooperative experimental mining of three longwall panels of Pocahontas coal with an imported German coal planer resulted in safe operation, better coal recovery, higher production per man-shift, and costs lower than in previous mechanized room-and-pillar mining. To extend the usefulness of this machine, Bureau engineers are cooperating with two companies who have purchased coal planers and are applying them to longwall mining of less friable coal.

Two methods of increasing production and recovery in thick, steeply pitching anthracite beds were improved during completion of the first sections of an experimental project and are being used in new test sections. Increased production, better backfilling, and reduced costs were achieved by using yielding steel props with backfilling in thick, flat beds of anthracite.

Four county reports on the investigation of known minable reserves of coking coal in Pennsylvania, West Virginia, Maryland, Kentucky, and Tennessee were published during the year. Reserves were determined in 4 other counties, and data are being collected in 11 others.

Coal preparation.—Bureau research showed that present coal-washing equipment can be adapted for use on some high-ash and small-size coals. Pilot-plant studies of heavy-medium coal cleaning, launder screens, and flotation and dewatering processes for small-size coals have developed less expensive mediums, improved operating techniques, and increased capacity of equipment.

Reports were published on washing characteristics of coals from Jefferson County, Pa., and Putnam County, Tenn., and preparation studies are continuing with coals from 1 Kentucky, 2 Tennessee, and 3 West Virginia counties.

Coking, gasification, drying, and combustion studies.—Design changes in the first commercial fluidized-bed lignite drier at Rockdale, Tex., developed by the Bureau in cooperation with a Texas power company, have substantially improved capacity and ease of operation and are being incorporated in eight additional units. The first fluidized carbonizer has been designed, and arrangements have been made for construction and testing. Work at the Denver, Colo., fluidized drying and carbonizing pilot plant was described in a report giving yields of chars, tar, and coal chemicals.

A pilot-scale vertical, continuous carbonizer was used to prepare medium-volatile char from Wyoming coals for blending to produce metallurgical coke and for use in reducing phosphates to elemental phosphorus. Lump, but not fluidized-bed, subbituminous-coal char was found suitable for making briquets.

Tests showed that removing certain constituents in coal washing and blending inerts can change some contracting coals to dangerously expanding and vice versa. Other studies revealed that all but 2 of 20 coals from West Virginia, Pennsylvania, and Tennessee can be blended to make metallurgical coke. Comparison of experimental and commercial slot-oven cokes showed close correlation of certain indices, differences of others.

Effective control of gob-pile fires with coal-washery sludge was demonstrated. Preliminary tests were run in a new, pilot semi-fluidized-bed gasifier for coking coals, and improvements and specific design details were developed for the vortex waste-material incinerator.

Coal constitution and analysis.—To help the Economic Committee for Europe develop an international coal-classification system, the Bureau analyzed coking coals, brown coals, and lignites to compare with those from European laboratories. More than 28,000 samples of coal, coke, dusts, and other carbonaceous materials were analyzed in connection with Government coal purchases, coal-mine inspections, and Bureau research. Methods of analyzing coal and ash for germanium and of restoring original bed moisture to partly dried, low-rank fuels for analytical classification were developed, and a coal-analysis laboratory was reestablished in Alaska.

Services to the Government.—The Bureau continued to help Federal agencies improve efficiency of fuel-burning equipment, lower costs, and select fuels, advising 54 agencies on 214 special problems. Bureau engineers recommended changes to improve operation of the Naval Power Factory boiler plant at Indian Head, Md. They also tested and adjusted equipment of a new boiler plant at the United States Penitentiary, Leavenworth, Kans. Acceptance tests of a new powerplant of the Hopi Indian Agency, Keams Canyon, Ariz., resulted in equipment changes and more efficient operation. A survey was made for the Mutual Security Agency of principal fuel-burning plants in the Philippines to find out if they could burn Philippine coal.

Coal sampling and analysis for Federal coal purchase and general research included 1,091 samples collected at 413 mines. In all, 11,435 analyses were reported to Federal agencies. At the Army's request, 77 cargoes of export coal, totaling about 550,000 gross tons, were sampled at tidewater piers. Analyses of 11,769 boiler-water samples resulted in operating recommendations to Federal boiler plants, and over 1,000 special water-test kits were given out for field use. Numerous industrial plants were visited on request to solve boiler-water problems, and general consulting service was given many Federal agencies. During the year a special field-testing device was developed which makes possible quick determination of the probable durability of pipe used in Federal heating systems.

Advice on smoke abatement was given eight cities, and work continued on an international air-pollution problem in the Detroit River area. Also, a detailed study was made of a new device for indicating smoke density.

A stream-pollution survey of 248 New England and New York plants yielded data on the amount of industrial wastes discharged into streams, and an agreement for trial of a Bureau-developed regeneration plan in a privately owned pilot plant brought nearer solution of the serious problem of waste-pickle-liquor disposal. A method was developed to determine small amounts of pine oil in waste water.

Coal economics.—During 1952 the downward trend in coal production was accentuated by steady growth in demand for energy to meet industrial and security requirements. The Bureau's statistical and economic data were used extensively in analyzing the shift from coal to other energy sources. Data on mechanzied production, preparation, mining methods, and other factors helped research toward increased mining efficiency.

The Bureau gave the Defense Solid Fuels Administration and other agencies essential information on coal, coke, and coal chemicals, including data on increased production facilities to meet coke requirements for steel and coal chemicals, estimates of material requirements for plant operations and maintenance, and analyses of productive capacity by geographical areas.

Trends and causal factors in production, consumption, stocks, exports, and imports were analyzed, and complex data for forecasting requirements necessary to provide adequate fuel supplies for military and civilian needs were assembled and interpreted.

Synthetic Liquid Fuels

The Bureau's research and development program for synthetic liquid fuels gave process information and fundamental data on improved methods for making lower cost and higher quality synthetic fuels from coal and oil shale. Engineering progress was made toward better equipment, greater continuity of operation, and lower costs in retorting oil shale, gasifying coal, converting synthesis gas to liquid hydrocarbons, and hydrogenating coal and oils derived from coal.

Oil from coal.—Using catalysts developed in the Bruceton, Pa., laboratories, Bureau scientists proved the chemical feasibility of producing high-quality gasoline from coal in a single hydrogenation step. Gasoline made was equivalent to 40 percent by weight of coal on a moisture-and-ash-free basis. A new pilot plant is being constructed to explore further the practical aspects of this process.

From domestic materials, a vapor-phase catalyst as active as German catalysts was developed for converting middle oil to gasoline. Rates of the coal-hydrogenation reaction and effects of hydrogen pressure on these rates were determined with various catalysts.

Also at Bruceton, improved techniques for activating steel shot and iron turnings resulted in development of a mechanically durable catalyst which in pilot-plant tests showed good synthesis-gas conversion for periods exceeding 6 months. Use of structural and chemical promoters with fused-iron catalysts gave promising results. Further improvements were made in a Bureau-developed process for removing carbon dioxide from synthesis gas by absorption with hot potassium carbonate solution under pressure. This process already has made possible considerable reduction in costs.

Operation of a pressure gasifier at Morgantown, W. Va., indicated that higher coal throughputs and lower material costs per unit volume of carbon monoxide and hydrogen produced could be obtained with this method than with gasification at atmospheric pressure. Experience gained in over 50 runs on a slagging gasifier at atmospheric pressure contributed to improvements in pressure gasification, and alterations being made on the pressure gasifier should improve its performance. Gas-purification experiments stressed development of improved analytical processes and recovery of sulfur from synthesis gas.

The new experiment station at Morgantown was about 40 percent complete at the end of the fiscal year.

Concluding tests on underground gasification of coal at Gorgas, Ala., showed that the heating value of product gas can be increased to 300 B. t. u. per cubic foot by using alternate blasts of air and steam or by using oxygen.

At Louisiana, Mo., Pittsburgh-seam coal and North Dakota lignite were hydrogenated in liquid-phase demonstration-scale runs to produce middle oil, which, along with oil obtained previously from Wyoming and Illinois coals, was converted to gasoline in the vapor-phase plant. The gas-synthesis demonstration plant completed its fourth run, during which it was on stream 39 days and synthesis-gas conversion averaged over 80 percent. Some gasoline from this run was treated over bauxite and blended with polymer gasoline to produce a stable motor fuel. These operations concluded the work of the coal-to-oil demonstration plants at Louisiana, which were scheduled to be shut down in June and July 1953.

Oil from oil shale.—Studies in the new pilot plant for high-temperature retorting of entrained oil-shale particles at Laramie, Wyo., showed that 1,200° F. is the best temperature for producing an aromatic oil which can be converted to gasoline by coking and hydrogenation. Stable motor fuel of high octane rating was made by these methods in a bench-scale unit. It was learned also that retorting at 1,400° to 1,500° F. gives maximum production of low-boiling aromatics. High-temperature retorting promises high shale throughput, flexible operation, and high-quality products.

Continuing research on the composition of shale-oil fractions emphasized development of analytical methods and investigation of sulfur- and nitrogen-containing compounds which complicate shale-oil refining.

The new, continuous, gas-combustion retort was completed and began operating during the year. Designed to handle 300 tons of shale a day, it will furnish data on design, mechanical workability, operating techniques, and oil production for private industry to use in constructing commercial oil-shale plants. Pilot-plant work on the gas-combustion process developed better rocket-burner designs which give improved retorting control, and additional refinery runs completed data on thermal and chemical treatment of shale oil.

To reduce costs and get more uniform shale for retorting, the oil-shale-mining system was changed from a 3-level to a 2-level plan, which involved altering ventilation methods and equipment design. Improvement of drilling techniques continued, and roof bolts were installed in the mine. Additional samples of cuttings from oil wells in the Green River Basin area were collected and assayed to supplement information on oil-shale reserves.

Petroleum and Natural Gas

Petroleum and natural-gas production.—Helping the Geological Survey gather fundamental data on radioactive minerals at Uravan, Colo., the Bureau used special drilling techniques and fluids to recover cores that are closely representative of the formation in which uranium occurs. This work is also of immediate value to the petroleum and natural-gas industries.

Studies were begun to solve primary- and secondary-recovery problems created by the presence of clay minerals, either in oil-producing formations or in drilling fluids. Physical properties of oil- and water-saturated sandstones were tested during work on the problem of shooting oil and gas wells with explosives, and a theoretical study of well-spacing problems was completed.

Much information was compiled on oilfields within the Missouri River Basin during the year, and 18 reports were published on engineering and secondary-recovery studies in California, Kansas, Oklahoma, Pennsylvania, Texas, West Virginia, and Wyoming. An invention report was filed on selective plugging with titanium dioxide smoke in gas-injection, secondary-recovery operations.

Cooperative research with the American Gas Association on flow of natural gas in pipelines was completed, and a report is being prepared.

Petroleum chemistry and refining; thermodynamics.—The Bureau continued during the year to contribute knowledge of important fundamental and empirical characteristics of crude petroleum, natural gas, commercial products and intermediates. Fiscal year 1953 was the twentieth year of cooperative monthly exchange testing of motor fuels, a program transferred to the Bureau of Mines from the National Bureau of Standards in 1950. The year also marked a decade of service by the Bureau's petroleum thermodynamics laboratory. During that time, more than 100 compounds, including sulfur, fluorocarbons, special fuels, and hydrocarbons, have been studied. Last year new understanding was gained of burning qualities of diesel fuels and fuel-oil stability in storage.

Reports published included 2 on motor gasoline, 1 on diesel fuels, 5 giving analyses of crude petroleum from fields in the United States and Canada, and 5 discussing thermodynamic properties of pure compounds.

Petroleum and natural-gas economics.—The petroleum industry continued to set many new records during 1952, but increases over 1951 were slightly less than in other recent years. Daily average production of crude oil was 1.7 percent greater than in 1951, and runs to stills increased 2.7 percent daily. Imports were 13.5 percent above 1951. The number of wells drilled—44,388—was 1,252 greater than in 1951, but the number of oil-producing wells completed increased only 13 to total 23,466.

Proved recoverable reserves of crude oil found during 1952 amounted to 2,749,288,000 barrels, or about 1.2 barrels for each one produced. At year's end, proved reserves were 27,960,554,000 barrels, 492,523,000 greater than at the end of 1951.

The widespread refinery work stoppage in May affected about one-third of the country's refining capacity; the stock position was severely disrupted, but no actual shortages developed.

By the end of 1952, industry was nearing the defense goal set by Government to have producing and refining capacities of approximately 1 million barrels a day over current needs.

The natural-gas industry continued to expand. Marketed production was 7.5 percent greater than in 1951; despite this, proved reserves increased 5,905 billion cubic feet to a total of 199,716 billion.

Helium

Bureau of Mines helium production reached a new high in 1953, when more than 150 million cubic feet was produced for Federal agencies and private users. This represents an increase of 20 million cubic feet over 1952 and necessitated reactivation of the last standby helium plant. At year's end all four of the Bureau's plants—at Amarillo and Exell, Tex.; Otis, Kans.; and Navaho (Shiprock), N. Mex.—were operating.

The Bureau continued to analyze samples of natural gas from new fields in 1953 in search of helium, and several new occurrences were investigated to determine their suitability as sources of supply for a helium plant. Research was continued to increase efficiency of helium production, distribution, utilization, and conservation.

EXPLOSIVES AND EXPLOSIONS RESEARCH AND TESTING

Explosives research.—The Bureau made 1,452 tests of permissible and special explosives and hazardous chemicals during the year. The number of explosives on the active permissible list remained at

174. About 17 percent less permissible explosive was used in coal mines than during the previous year, a fact largely due to a reduction of nearly 12 percent in the tonnage of coal produced. The ratio of permissibles to black blasting powder was 13 : 1, the highest in history.

A new testing schedule was formulated during the year, specifically for blasting devices used to break coal. The applicability of nitrogen tetroxide as an ingredient of industrial blasting explosive is being studied. Fundamental research in the physics and chemistry of explosives has led to a new, precise method for measuring detonation rates, and a Bureau-developed electronic camera makes it possible to photograph phenomena that occur during detonation.

Gas- and dust-explosion research.—The Bureau continued its attack on dust-explosion hazards, testing explosive characteristics of 80 different dusts, including those of American coals from lignite to meta-anthracite. A rapid method was developed for evaluating incombustible content of coal-mine dusts underground. Research was completed on rock-dust bag devices for arresting coal-mine explosions and on water infusion for reducing dust during mining.

Explosive properties of flammable gases, vapors, and sprays are being determined over a wide range of temperatures and pressures for application to military and industrial problems. The Bureau is investigating explosive characteristics of aircraft fuels under simulated high-altitude flight conditions. A partial study was made of secondary explosion hazards in ventilating ducts on ships, and the program for eliminating anesthetic gas explosions in hospitals was continued.

In fundamental research on ignition and flames, progress was made in techniques for measuring burning velocities of turbulent flames and flames at low pressures; these should be useful in jet combustors and other engines and rockets. Investigation of combustion at molecular and atomic levels continued, and progress was made in research on design and operation of commercial gas burners.

MINERAL ECONOMICS

The Bureau continued, during the year, to collect and publish statistics on minerals and to study the economic factors affecting the mineral industries.

Research on taxation continued to concentrate on the structure of mineral taxation and on its economic impact. Studies were performed on such matters as comparing in detail how minerals produced in the United States during the years 1946 through 1949 would have fared under the Canadian system of percentage depletion; the impact of percentage depletion at various rates on the economic feasibility of synthetic liquid fuels; the analysis of alternative forms of excess profits tax assistance for strategic mineral production; the examination of the treatment of coal royalties as capital gains rather than as ordinary income; and Federal taxation as a proportion of gross income in the extractive industries.

The Bureau prepared a history and analysis of tariff rates on specific metals and minerals for 1924, 1931, 1945, 1948, and 1950 and cooperated with other agencies in studying the effects of tariffs on production, employment, and investment in the mineral industries. Also, current legislation which changes tariffs and income taxes affecting various minerals and fuels was analyzed. Bureau members represented the Department at meetings of the Interdepartmental Trade Agreements Committee.

By supplying data for estimating future supplies and requirements of minerals, the Bureau's economic research helped to provide a sound basis for planning mineral-development programs.

Interindustry research continued during the year, methods being developed for estimating requirements of such critical materials as manganese, tin, chromite, cobalt, rutile, tungsten, vanadium, and fluorspar. Progress was made also in determining the amount of equipment and other capital items required per unit of capacity in various strategic-minerals industries. This work is part of a larger Federal program designed to measure the effects of mobilization on specific industries.

Statistical canvasses were reviewed during the year to decrease the Bureau's operating costs where possible and to make reporting easier for industry. The Bureau cooperated with the National Production Authority on statistical schedule and decontrol problems and proceeded with arrangements for new contracts under which the system of cooperating with State governments in collecting mineral statistics will be enlarged and improved. Progress was also made in setting up a unified establishment list on all mineral producing and using establishments from the separately maintained mailing lists of the Bureau, and from the information on mining establishments reported to the Bureau of Old-Age and Survivors Insurance.

FOREIGN ACTIVITIES

Bureau of Mines foreign-minerals activities fall into two major categories: Fact finding and analysis, and technical assistance. This work is handled by the foreign-minerals region, with headquarters in Washington, D. C.

Fact-finding and analysis.—The United States is becoming increasingly dependent on foreign sources for its mineral supply, and a steady expansion in quantity and variety of mineral requirements is multiplying the problems of Government and industry in maintaining adequate supplies. The Bureau assists Government and industry by providing reliable, up-to-date information on which to formulate measures to overcome these problems.

With the shifting pattern of mineral supply, American capital has become increasingly active in seeking foreign resources for development. Meanwhile, opportunities for profitable investment in many parts of the world have declined as foreign Governments have imposed restrictions. Significantly, nations that have adopted realistic mining laws to encourage the influx of foreign capital are reaping the benefits of a postwar mining boom in which American capital and know-how are playing a leading role. The Bureau of Mines fact-finding services in this field are used extensively by industrial concerns contemplating foreign investments. The Bureau is also called upon from time to time to give counsel to United States and foreign Government officials who are endeavoring to assist in modifying existing regulations to stimulate the flow of venture capital to undeveloped mineral areas of the world. There was increased interest in this problem last year.

Reliable information on foreign mineral operations also serves American manufacturers who export large quantities of mining equipment and supplies. This trade has been stimulated in the postwar period by United States foreign-aid and defense-procurement programs, and curtailment of these programs will create a need for alternate markets. The Bureau makes a special effort to obtain up-to-date data on current and prospective production rates and technology employed in foreign areas.

Mineral resources, as well as production and utilization, have an important bearing on the industrial and military potential of any nation or region. Consequently, the Bureau's fact-finding activities related to resources, production, consumption, and international trade in minerals and its analytical reports dealing with the mineral economy of foreign areas are essential to formulating industrial and military strategy. The Bureau's foreign mineral specialists are consulted frequently by intelligence officers, stockpile planners, and procurement officials. In addition to a moderate increase in the statistical facilities of the Bureau of Mines, there is need for greater emphasis on mineral reporting by the Foreign Service of the United States, one of the main sources of basic information used by the Bureau of Mines and other Government agencies. The Service has only five mineral attachés who obtain and interpret vital information for the United

States and provide information on our domestic mineral economy to foreigners interested in buying United States products or selling in United States markets.

Technical assistance.—Supported by the extensive testing and research facilities and technical staff of the Bureau of Mines, the Foreign Minerals Region is able to give effective technical help to friendly foreign areas under Technical Cooperation Administration, Mutual Security Agency, and other assistance programs. This involves cooperation with foreign engineers conducted by Bureau men stationed abroad, testing and research work related to foreign mineral production and utilization performed in Bureau laboratories, and training of foreign technicians both abroad and in Bureau establishments.

During 1953 the Bureau gave direct assistance to 16 countries under the technical and economic assistance programs of the United States. In Afghanistan coal production was increased, and for the first time in history the nation's capital had enough coal for the winter. Bureau laboratories made further progress on the development of new technology for treating Bolivian tin ores. The Bureau's engineer in Brazil helped solve problems related to phosphates, tungsten, and tantalite and assisted United States agencies with mobilization procurement in Brazil. A team in Burma helped to formulate plans for stimulating mineral-resources development. The major recommendations of the Bureau appear to have been adopted by the Burmese Government, even though subsequently further economic and technical assistance from the United States was declined. Improved utilization of coal resources dominated activities in India, Formosa, Colombia, and the Philippine Islands. Thailand has requested help in developing its lignite deposits. Bureau teams are assisting the Governments of Israel and Nepal in evaluating mineral potentials. Assistance is being given to the Hashemite Kingdom of Jordan in the development of markets for manganese ore of high impurity content and to Pakistan in planning the utilization of coal in a new fertilizer plant now under construction.

The Bureau's largest Point Four team is in Mexico, one of our most important sources of strategic minerals. During 1953 the Bureau helped the Mexican Government to increase production of scarce defense minerals.

A phase of the Bureau's foreign activity is the training of technicians who come to us from abroad. Trainees range from graduate students who desire intensive tutoring in a specialized field to mature Government executives who wish to study Bureau organization and administration or policy questions, or merely to observe the American mining industry firsthand. During 1953, 32 trainees from 13 different countries received training with the Bureau of Mines.

RIVER BASIN ACTIVITIES

Water and power are often determining factors in the success or failure of a mineral industry. The Bureau of Mines is active in the Department's cooperative interagency river-basin program.

Arkansas-White-Red River Basins.—A survey of mineral-industry and mineral-resource potential is progressing in the Arkansas-White-Red River Basins in eight States. Detailed field inventory studies are made on a county-by-county basis. Twenty-five special county reports have been released to the Interagency Committee, and many others are about ready. Six basin-State summary reports were similarly distributed. The benefit of field inventories is illustrated in a group of 18 counties where the literature showed 203 mineral deposits and field reconnaissance revealed 208 additional. Examination of over 50 reservoir sites indicated that mineral industries would be involved in over half, some benefited, and some damaged. Special studies in such problem areas are planned.

Missouri River Basin.—Mineral resources of selected areas in the Missouri River Basin are being investigated and studies made of their development and use. Eleven reports were made, and eight more are nearly ready. A number of industrial-feasibility studies are underway, including work on chromite, cement, phosphates, ammonia, and lightweight aggregates.

Vibration data from blasting were collected and their effect on "green" concrete analyzed at the Army's request.

New England-New York survey.—Surveys and 28 commodity reports were made on the mineral resources and mineral industry of New England and New York. Special subbasin reports on 34 areas were prepared in cooperation with the Geological Survey.

The mineral-industrial-waste aspect of stream pollution was studied at 298 plants by Bureau engineers.

Other river basins.—In Alaska, Pacific Northwest, Colorado-Great Basin, and California mineral investigations related to water and power development are also underway.

PUBLIC REPORTS

As directed by its organic act, the Bureau of Mines makes the results of its research and investigations available through its own publications and through contributions to the scientific and technical press. During the fiscal year 1953, 604 manuscripts were approved and edited, compared with 630 in 1952.

Printed publications totaled 102, including 16 bulletins, 69 Minerals Yearbook chapters and 1 bound volume, 2 handbooks, and 14 miscellaneous items. Processed reports totaled 172, including 95 reports of investigations, 22 information circulars, 15 Mineral Trade Notes and supplements, and 40 miscellaneous reports. Much of the literature describing Bureau of Mines investigations is presented orally before technical and trade organizations and published in their journals; 330 manuscripts of this type, including a number of special reports, were handled during the year. In all, over 22,000 pages of manuscript were edited and about 2,300 illustrations prepared for printing or processing. The Senate hearings on the Interior Department appropriation bill were indexed for the 11th consecutive year.

Films from the Bureau's free loan library of informational motion pictures were shown 213,771 times, a 3-percent increase over the 207,300 showings in the preceding fiscal year and a new alltime high. By contrast, showings during fiscal year 1948, 5 years earlier, totaled 133,030. Recorded attendance of 12,934,237 was 1 percent below the alltime record of 13,088,335 set in fiscal year 1952. Additional showings were made over many television stations.

During the year 579 copies of films were added to the loan library, and 729 copies were withdrawn from circulation because of obsolescence or wear. Two new film subjects were added to the loan library.

ADMINISTRATION SUMMARY

Work was continued on the Bureau of Mines Manual. The following parts were issued during fiscal year 1953: Part 23 (Leave) of volume II (Personnel); part 1 (Program Guidance) of volume III (Program Guidance and Reporting); part 2 (Reporting) of volume III (Program Guidance and Reporting); and part 1 (Property Accounting) of volume IV (Property Management). Preparation of other parts of the manual is in progress.

The Office of the Bureau Safety Engineer continued to correlate the employee safety and health program which has been increasingly effective for 7 years and was particularly so during the calendar year 1952, for the number of lost-time injuries per million man-hours of work (frequency rate) dropped from 12.1 for the preceding year to 9.2, each successively being the lowest of record. The number of days lost per thousand man-hours of work due to injuries (severity rate) was also the lowest of record. This loss was 77.5 percent less than in calendar 1951, which in turn was 43 percent less than the preceding 5-year average. As the injury rates for industry have generally increased during this same period the success of the Bureau's employee-safety program has been remarkable and has received special commendation from the Administrative Assistant Secretary.

These successes have been achieved at minimum cost with only 5 full-time plant safety engineers, 1 safety officer (trainee), and 1 safety inspector in the field in addition to the Bureau safety engineer and a secretarial-statistical assistant in the central office. Travel and other expense has been maintained at the minimum effective level.

Fire losses during the calendar year 1952 continued commendably low. Five fires occurred, one more than in 1951, but with much less loss of property than in 1951 and no injuries. Three fires occurred at the Bruceton, Pa., station, one from an unknown cause with building damage only of an estimated $3,000 and another when sparks from a grinding wheel ignited a pile of trash. There was no monetary loss from this fire. The third resulted from ignition by hot-metal sparks from a cutting torch of a wiping rag hanging on the wall. This resulted in an estimated damage to the building of $5. The remaining two fires occurred at the Louisiana, Mo., station. One was in reality an explosion and not a fire, which occurred in a ball mill pulverizing coal. The cause was believed to be the sparking of accumulated static electricity. Damage to the building was estimated at $1,700 and to equipment at $2,280. The second fire at this station was due to a leaking lens ring in high-pressure hydrogenation piping. Vapors fired spontaneously upon contact with air and caused a total estimated damage to the building and equipment of $45.

In the operation of 1,051 motor vehicles, Bureau of Mines operators were involved in 47 accidents during 6,570,944 vehicle miles of travel in the calendar year 1952. Three Bureau employees suffered major injuries, and three other persons suffered minor injuries. In 18 of these 47 accidents, Bureau operators were judged wholly at fault, but in 2 of these instances the equipment was faulty. Total known or estimated property damage reported was: Government, $10,207.55; private property, $1,935.46. Four claims were allowed to private citizens under the Federal Tort Claims Act for motor-vehicle damages that totaled $1,124.25 in awards. Both in numbers and amounts of claims there was improvement over the preceding calendar year.

Personnel.—On June 30, 1953, there were 5,005 full-time employees in the Bureau of Mines, distributed as follows:

TABLE 1.—Schedule and number of employees

	GS	CPC	Ungraded	Total
Departmental	663	11		674
Field	3,079	229	1,023	4,331
Total	3,742	240	1,023	5,005

Property.—Property records of the Bureau of Mines, as of June 30, 1953, show accounts as follows:

Automobiles and trucks	$2, 301, 909. 62
Canvas and leather goods	23, 096. 00
Drafting and engineering instruments	120, 071. 68
Electrical equipment	458, 028. 77
Hardware and tools	539, 930. 54
Household equipment	126, 607. 29
Laboratory equipment	6, 791, 026. 82
Medical equipment	45, 746. 82
Office furniture and equipment	2, 466, 728. 50
Photographic apparatus	256, 683. 12
Machinery and powerplant equipment	10, 491, 487. 76
Land, buildings, and improvements	32, 269, 185. 42
Specialized equipment and apparatus	15, 108, 265. 35
Total	70, 998, 767. 69

This property is in Washington, D. C., and at the various installations in the field.

Finance.—The total funds available to the Bureau of Mines for the fiscal year ended June 30, 1953, including appropriations, prior-year balances available, reimbursements, advances, and transfers from other Government agencies, proceeds from helium operations, and contributions to trust funds from non-Government sources, were $43,080,794. Of this amount $35,529,482 was obligated, leaving an unobligated balance of $7,551,312. During fiscal year 1953 a new accounting system for the Bureau was devised and a manual prepared to permit installations in all Bureau offices effective July 1, 1953.

Funds available to the Bureau of Mines for fiscal year 1953 (by source of funds):

Direct appropriations	$27, 881, 000
Deduct: Appropriations to liquidate contract authorizations	2, 600, 000
Net direct appropriations	25, 281, 000
Prior-year balance available	3, 863, 182
Reimbursements from other Government agencies	673, 393
Advanced or transferred from other Government agencies	10, 155, 132
Proceeds from helium operations	2, 554, 276
Contributions to trust funds from non-Government sources	553, 811
Total, Bureau of Mines	43, 080, 794

Obligations incurred by the Bureau of Mines in the fiscal year 1953 (by appropriation):

Conservation and development of mineral resources	$18, 426, 073
Health and safety	4, 346, 980
Construction	1, 076, 299
General administrative expenses	1, 260, 143
Construction and rehabilitation, Bureau of Reclamation (transfer to Bureau of Mines)	130, 987
Working fund, Interior, Mines	6, 735, 220
Working fund, Interior, Office of the Secretary	504, 065
Research in the utilization of saline water	4, 410
Economic and technical assistance, Asia and Pacific, title III, Mutual Security Act, executive (transfer from State to Interior)	2, 981
Program expenses, Asia and Pacific, Mutual Security Agency (allocation to Interior)	20, 423
Development and operation of helium properties	2, 437, 492
Contributed funds	584, 409
Total obligations incurred	35, 529, 482
Unobligated balance, June 30, 1953	7, 551, 312
Total, Bureau of Mines	43, 080, 794

BUREAU OF RECLAMATION

Wilbur A. Dexheimer, Commissioner

INTRODUCTION

The Bureau of Reclamation, swinging into its second half century of responsibility in the conservation and development of the water resources in 17 arid or semiarid States of the West, contributed record-breaking agricultural crops and hydroelectric power production from its multiple-purpose projects to the Nation's economic structure during the fiscal year ending June 30, 1953.

Concurrently, revision of Bureau policies and procedures, looking toward maximum economy and efficiency in organization and operations in Washington and the field, was set under way.

The resignation of Michael W. Straus as Commissioner of Reclamation became effective February 6, 1953.

Wilbur A. Dexheimer became Commissioner of Reclamation on July 13, 1953.

DESIGN AND CONSTRUCTION

In carrying out its construction program for fiscal year 1953, the Bureau of Reclamation established an impressive postwar production record on reclamation water resources development projects throughout the West and in Alaska. About $203.8 million were converted into reclamation works, an investment in dams, powerplants, irrigation canals, pumping plants, electric transmission lines, and other wealth-creating facilities available to serve the West and the Nation as a whole.

Construction completed during the year added about 3,700,000 acre-feet of storage capacity in new reclamation project reservoirs, 240,000 kilowatts of electric generating capacity, 700 miles of canals, pipelines, and laterals, and 1,938 miles of large electrical transmission lines.

The total value of all contracts awarded in the fiscal year 1953 amounted to about $99 million, comprising the face value of more than 450 separate contracts for construction, materials, equipment and supplies. Of this total contract aggregate, construction contracts accounted for $87 million, or about 88 percent. Construction contracts in force at the end of the fiscal year totaled about $260 million.

In addition to the construction program under way, a program of new starts was authorized by the 82d Congress under which the Bureau was directed to begin construction on 10 new projects or units in the West. Pactola Dam in South Dakota, Tiber Dam and Missouri diversion dam in Montana, and Webster Dam in Kansas were authorized to be built on the Missouri River Basin project. Other structures authorized to be started included Monticello Dam on the Solano project in California; Sly Park Dam on the Central Valley project in California; Chandler power and pumping plant on the Kennewick division of the Yakima project in Washington; and the Gateway tunnel on the Weber Basin project in Utah. In Oregon the Bureau was authorized to undertake the rehabilitation of Savage Rapids Dam on the Grants Pass project, and in Idaho, another new start was the authorization for construction on the North Side pumping division of the Minidoka project.

The Bureau began construction on all of the 10 project undertakings called for by the Congress with the exception of Monticello and Missouri Diversion Dams. Construction of these two dams was expected to get under way during 1954 fiscal year.

The year will be remembered for completion nearly 1 year ahead of schedule of Hungry Horse Dam on the Hungry Horse project in Montana, third highest of Bureau dams; for the installation of units P–5 and P–6 of the Grand Coulee pumping plant, bringing this Columbia Basin project feature to its full presently scheduled capacity; for completion of Cachuma, Glen Anne, and Lauro Dams on the Cachuma project in California; and for completion of Keyhole Dam on the Missouri River Basin project in Wyoming, Big Sandy Dam on the Eden project, also in Wyoming, and Willow Creek and Rattlesnake Dams and Carter Lake Reservoir on the Colorado-Big Thompson project in Colorado. In December, Davis Dam was dedicated, in recognition of the completion of Davis Dam and powerplant, newest in the series of Bureau structures to control the lower Colorado River for multiple-purpose use.

Bureau engineers were sent abroad to many countries of the world, particularly in the Middle East, to advise on water-resources developments and to assist officials of foreign countries in carrying out their programs. In addition, the Bureau supplied technical assistance through negotiated agreements with several countries, and by training foreign nations in Bureau design and construction practices.

Contract Awards

Summarized in table 1 are the major construction and supply contracts (larger than $1 million) awarded by the Bureau of Reclamation in fiscal year 1953. The structures authorized under the "new starts" program for the fiscal year were prominent among those placed under contract for construction. Other features for which contracts were awarded included 59.5 miles of pipelines for the San Jacinto-San Vicenta aqueduct on the San Diego project in California; Kirwan Dam on the Missouri River Basin project in Kansas; 65.2 miles of pipelines and 36.2 miles of laterals on the Central Valley project in California; and generators and turbines for the Palisades powerplant on the Palisades project in Idaho.

TABLE 1.—Major Bureau of Reclamation contracts awarded in fiscal year 1953

Feature	Project	Amount of award
Tiber Dam and dike	Missouri River Basin	$12,838,692
30.7 miles of pipelines for San Jacinto-San Vicente aqueduct	San Diego	7,832,648
28.8 miles of pipelines for San Jacinto-San Vicente aqueduct, adjacent to existing San Diego aqueduct.	do	6,798,101
Completion of Kirwin Dam	Missouri River Basin	6,729,671
30 miles of East Low Canal and 5 miles of Scooteney wasteway	Columbia Basin	2,904,235
Sly Park Dam	Central Valley	2,716,785
65.2 miles of pipelines for unit 2, Delano-Earlimart Irrigation District, Friant-Kern Canal.	do	2,588,203
Gateway tunnel	Weber Basin	2,486,613
36.2 miles of laterals for Madera distribution system	Central Valley	2,096,200
27 miles of Dome Canal and unit 1 of Dome distribution system	Gila	1,990,792
generators for Palisades powerplant	Palisades	1,977,822
4.2 miles of laterals, sublaterals, and wasteways, and 8.5 miles of pipelines, East Low Canal, area E-5 laterals.	Columbia Basin	1,798,930
9 miles of concrete lateral lining for unit 3, Mohawk distribution system.	Gila	1,632,673
22 miles of Fort Randall-Sioux City transmission line	Missouri River Basin	1,657,745
.6 miles of Chandler Canal	Yakima	1,613,279
Four hydraulic turbines for Palisades powerplant	Palisades	1,421,700
0.4 miles of Wellton Canal and unit 1, Wellton distribution system.	Gila	1,318,474
2.6 miles of laterals and 3.5 miles of pipelines, area P-8 laterals, Potholes East Canal.	Columbia Basin	1,164,931
1.5 miles of Franklin Canal and 1.8 miles of concrete pipecanal siphons.	Missouri River Basin	1,152,881
Penstock manifold and outlet pipe manifold for Palisades Dam and powerplant.	Palisades	1,098,600
9 miles Bartley Canal, 13 miles laterals, 6 miles surface drains	Missouri River Basin	1,091,070

Shown in table 2 are the principal features completed on Bureau of Reclamation projects in fiscal year 1953. These features include 9 storage dams and 1 diversion dam, 700 miles of canals, pipelines, and aterals, 13 miles of tunnels, and 1,938 miles of transmission lines.

TABLE 2.—Principal features completed on Bureau of Reclamation projects in fiscal year 1953

Feature	Project	State
Pumping units P-5 and P-6 of Grand Coulee pumping plant.	Columbia Basin	Washington.
100 miles main canals, pipelines, and wasteways	do	Do.
168 miles laterals	do	Do.
Frenchman Hills tunnel	do	Do.
1.8 miles power and outlet tunnels for Palisades Dam.	Palisades	Idaho.
Hungry Horse Dam and powerplant building	Hungry Horse	Montana.
Cachuma Dam	Cachuma	California.
Lauro Dam	do	Do.
Glen Anne Dam	do	Do.
1.1 miles Sheffield tunnel	do	Do.
208 miles irrigation pipelines	Central Valley	Do.
Completion of Davis Dam spillway	Davis Dam	Arizona-Nevada.
50 miles irrigation pipelines for Coachella Valley distribution system.	All-American Canal System.	California.
70 miles canals and laterals for Wellton and Mohawk distribution systems.	Gila	Arizona.
Big Sandy Dam	Eden	Wyoming.
6.5 miles Means Canal	do	Do.
Duchesne diversion dam	Provo River	Utah.
5.3 miles Duchesne tunnel	do	Do.
8.5 miles laterals for Wyoming Canal	Riverton	Wyoming.
Keyhole Dam	Missouri River Basin	Do.
Franklin South Side pumping plant	Missouri River Basin (Bostwick Unit).	Nebraska.
1,025 miles transmission lines	Missouri River Basin	North Dakota, South Dakota, Montana, Wyoming.
Boysen Dam powerplant	do	Wyoming.
27 miles canals and drains and 53 miles laterals	Missouri River Basin (Frenchman-Cambridge Unit).	Nebraska.
Carter Lake Reservoir	Colorado-Big Thompson	Colorado.
Rattlesnake Dam	do	Do
Willow Creek Dam	do	Do.
14 miles supply canals	do	Do.
Pole Hill and Flatiron powerplant buildings	do	Do.
69 miles transmission lines	do	Do.
1.3 miles Bald Mountain pressure tunnel and 2.7 miles North Poudre supply canal tunnels.	do	Do.
41 miles transmission lines	Eklutna	Alaska.
92 miles transmission lines	Fort Peck	Montana.
36 miles transmission lines	Kendrick	Wyoming.

Progress of Construction

On the Hungry Horse project in Montana, concrete placement in the 3,000,000-cubic yard Hungry Horse Dam was finished in October 1952. The first two of Hungry Horse powerplant's 71,250-kilowatt generators were placed in operation in the fall of 1952; installation of the remaining two units was virtually completed at year's end.

Four structures.—Cachuma, Glen Anne, and Lauro Dams, and the Sheffield tunnel—were completed on the Cachuma project in California. The 14½-mile long Carpinteria section of the South Coast conduit neared completion, and construction of the Goleta distribution system was started.

For the Columbia Basin project in Washington, the fifth and sixth giant Grand Coulee pumps were placed in operation in May 1953. Conveyance and distribution of this pumped water to the project's irrigation system was implemented by completion during the year of the Frenchman Hills tunnel, 26 miles of pipelines, about 72 miles of canals and wasteways, 23 pumping plants, and 167 miles of laterals.

Central Valley project construction in California was notable for extension of the irrigation distribution systems under the Friant-Kern, Madera, and Contra Costa canals—an aggregate of 208 miles of irrigation pipelines and 10 pumping plants were completed during the year. Under construction at the end of the year were 120 miles of pipelines and 16 pumping plants. On the project's Sly Park unit, the Camp Creek tunnel was excavated and construction of the diversion dam was continued.

In southern California, the last major contract on the All-American canal project area was awarded for completion of an 11-mile reach of concrete pipeline in the Coachella Valley distribution system. Approximately 50 miles of pipelines for the system were finished during the year.

In Wyoming, Big Sandy Dam was completed on the Eden project. A major milestone on the Provo River project in Utah was the completion of the 5.3-mile-long Duchesne tunnel.

On the Missouri River Basin project, the year was noteworthy for the placing in full service of the 15,000-kilowatt Boysen powerplant in Wyoming. Outstanding progress was made in the integration of large areas in the States of Montana, North Dakota, South Dakota, and Wyoming into a coordinated network of electrical transmission lines for transmission of energy from powerplants under construction by the Bureau of Reclamation and the Corps of Engineers, Department of the Army . More than 1,000 miles of transmission lines were completed in these four States during the year, and work continued at year's end on an additional 500 miles of lines. Many of the completed lines, while not transmitting full voltage, were already in use by rural cooperatives and by other users.

In other areas of activity on the Missouri River Basin project, Keyhole Dam was completed in Wyoming, and Trenton Dam in Nebraska was virtually finished. At Canyon Ferry Dam, a major project structure in Montana, concrete placement reached spillway crest level, and reservoir storage was begun in March 1953. Work was ahead of schedule on Kirwin Dam in Kansas, Jamestown Dam in North Dakota, and on the foundation for Weber Dam, also in Kansas.

In furthering development of the Missouri River Basin project's irrigation system, the 92-mile long Angostura Canal in South Dakota was essentially completed at year's end. The third section of the Cambridge Canal in Nebraska, was completed, extending the canal length to 30 miles. The last section, embracing 29 miles of laterals, of the Superior Canal lateral system in Nebraska was also completed. Bartley diversion dam in Nebraska and Bartley Canal and lateral system were placed under construction. In Kansas the Franklin south side pumping plant and its associated canal and lateral system were finished during the year.

Completion during the year of several major features on the Colorado-Big Thompson project in Colorado brought assurance that this large transmountain diversion development would be in full operation in 1954. Completed were Carter Lake Reservoir, Rattlesnake Dam, Bald Mountain pressure tunnel, Carter Lake pressure conduit, the 4-mile long Flatiron section of the Horsetooth feeder canal, the 12.6-mile long North Poudre supply canal, and Willow Creek Dam. The 56-mile long Salida-Gunnison and the 35-mile Flatiron switchyard-Fort Collins-Cheyenne tap transmission lines were placed in service in the fall of 1952. Willow Creek pumping plant was three-fourths finished and the Pole Hill and Flatiron powerplant structures were completed at the end of the fiscal year.

On the Eklutna project in Alaska, being built to bring power to the Anchorage and Palmer areas, excavation of the 4½-mile long Eklutna tunnel continued.

Excavation of the 1,400-foot long penstock tunnel from the surge tank to the Eklutna powerplant was completed in March.

Excavation for the Eklutna powerplant foundation was started in June 1953. The 16-mile long Eklutna-Palmer and the 26-mile long Eklutna-Anchorage transmission lines were completed and placed in temporary service during the year.

The installed capacity of the Eklutna powerplant is to be 30,000 kilowatts. The development of this hydroelectric power from the stored waters of Eklutna Lake will assist materially in overcoming the acute power shortage caused by the increase of military activities in the Anchorage area and will likewise assure the economic expansion of the civilian economy.

Design Activities and Developments

Design of the 10 new 1953 project undertakings proceeded on rush schedule. Although some rescheduling of the program was necessary, construction work was not delayed.

A significant design development was the adoption of more liberal design criteria, which made possible an estimated 22½-percent reduction in the weight of standard 230-kilovolt, steel suspension towers for transmission lines in heavy loading areas. Use of the new tower on one line alone will represent a savings of about a quarter-million dollars.

The fiscal year saw the first issuance of Bureau specifications to permit bidding for use of prestressed precast concrete in bridge decks.

Final tests were conducted on the Grand Coulee pumps and the six discharge lines for units P–1 to P–6, inclusive.

During the year, designs, detail drawings, and specifications were prepared calling for the use of special safeguards and safety equipment at various Bureau installations. These safeguards were designed to prevent such serious operating incidents as the one which occurred at Grand Coulee Dam in March 1952, when one of the outlet gates in the dam was inadvertently opened, producing a major power outage.

The quality of the Bureau's design work was recognized by the American Institute of Steel Construction through award of a first prize in its annual competition for bridge design to the spillway bridge at Davis Dam, and honorable mention for two other structures.

The Bureau's investigations and development in lower cost canal linings continued active during the year.

Sixteen designers' operating instructions were prepared and issued as guidance in the proper and efficient operation of installed equipment and machinery on Bureau projects. These criteria embraced those for operation of 7 storage dams, 2 diversion dams, 5 canals, 1 powerplant, and other features including an extensive radio network.

Specification Requirements

Progress was made in specifications improvement, partly through field experience and partly as a result of conferences with contractors. Through discussions with a "task unit" of the Associated General Contractors of America a formula establishing equitable rental rates to be paid for use of contractor's equipment on extra work was included in specifications requirements. In addition, as a result of joint Reclamation-AGC task unit conferences, specifications for batching, mixing, and placing of concrete were revised.

European manufacturers appeared frequently as bidders on Bureau specifications, principally on large electric equipment. Foreign firms or American firms operating essentially as importers of foreign equipment were awarded 12 contracts for electrical equipment. (Under the Buy-American Act, a 25-percent differential is added to all foreign bids before they are compared with domestic bids. If such foreign bids then remain below the lowest domestic bid, they may be considered for award.)

Administrative Developments

Intensive efforts in the preparation of designs for newly authorized construction in minimum time were carried forward during the year. To reduce costs and improve efficiency, a number of organizational changes were made during the year.

As in past years, a training course, conducted by the engineering laboratories, was given to 40 field engineers, covering the subjects of concrete and concrete materials, earth materials, paints and other protective coatings and their applications, asphaltic materials and their use, and metals.

Research Activities

Drainage and ground-water activities during the year emphasized the investigation of feasibility of new project lands, although other project lands were under study for control of seepage, high ground water, and protection from flood runoff.

Particularly active were the studies made for the Garrison Diversion unit and the Oahe unit of the Missouri River Basin project in North and South Dakota, respectively.

Bureau drainage and ground-water specialists attended a course in ground-water hydrology sponsored jointly by the Bureau and the Geological Survey to advance the knowledge and techniques in this important branch of engineering science.

Design and construction practices benefited greatly from experience gained on operating projects. Reports, photographs, and motion pictures of operation and maintenance problems and developments on 23 Bureau projects, 7 privately owned and operated irrigation projects, and in 16 Bureau field offices, led to the designing and building of more economical and efficient irrigation systems.

During the year, the Bureau issued a canal safety bulletin to acquaint design and construction engineers, operation and maintenance personnel, and officials of water-user-operated projects of the latest advances in safety practices for the operation of canals and other waterway structures.

The work of the engineering laboratories in Denver during the year contributed substantially to design improvement of hydraulic structures, extended engineering knowledge in application of materials to new construction, and assisted in the solution of a number of complex construction problems.

Hydraulic-model studies assisted in the design of numerous structures, including the spillways for Kirwin, Webster, and Sly Park Dams.

Tidal current meters used to measure water flows in the Delta Cross Channel on the Central Valley project in California were modified in the hydraulic laboratory and were recalibrated.

A radio-reporting gage was developed by laboratory and field engineers to meet the need for prompt transmittal and assembly of information on precipitation in the Sacramento River watershed in California as a guide to Shasta Dam water-release operation. Six of the instruments were built and installed during the spring of 1953.

Concrete tests and studies as usual formed a large part of the engineering laboratories' activities.

Dry ice was found to be an inefficient means of cooling concrete, costing more than four times as much as ordinary ice for equal effect.

Testing of rock cores to determine the competency of foundations of several proposed dam sites continued during the year.

The unified soil-classification system was approved by the Department of the Army and the Navy's Bureau of Yards and Docks, thus culminating the Bureau's efforts to standardize and simplify soil classification within its organization and leading to improved interchangeability of soils information with other Government agencies.

Intensive study of bituminous materials for construction led to the use of asphaltic concrete in protecting the upstream slope of Glen Anne Dam on the Cachuma project. Use of the asphaltic concrete in lieu of more expensive riprap for the slope protection resulted in substantial savings.

A total of 160 laboratory reports embracing such areas of research as concrete, earth materials, and bituminous construction, geological investigations, hydraulic studies, and structural, paint, and petrographic examinations were made available during the year.

Work Performed for Other Agencies

The Division's technical skills and experience were again in demand by other Federal agencies and foreign governments during the year. In addition to design and other services for the Falcon Dam and powerplant of the International Boundary and Water Commission, design and construction of the second barrel of the 72-mile long San Diego aqueduct was continued for the Navy Department. At the request of the Atomic Energy Commission, Bureau geophysicists conducted field tests to determine whether geophysical techniques developed by the Bureau could be used in the search of uranium ores. Through joint field examinations, the Corps of Engineers is supplied Bureau data on glacial-clay landslides in Lake Roosevelt and in the Grand Coulee tailrace areas for the Corps' use in the study of similar conditions encountered in the Chief Joseph Reservoir.

Advisory services were also rendered to the Navy Department for an airfield runway in Guantanamo Bay, Cuba, and for repairs of a large reservoir at a Navy depot in Nevada. Laboratory assistance through tests of cements and aggregates was given to a private consulting engineer firm for use in design of a proposed dam in Turkey. The Denver Board of Water Commissioners was assisted by laboratory guidance in tests of mass concrete for a dam under construction by the Board.

Laboratory hydraulic-model studies were made of a spillway for a proposed dam in India and for the spillway of the Cleveland Dam in Canada; spillway crest studies of Ross Dam were made for the city of Seattle.

Other technical services were rendered to the Thailand Government by training of Thai engineers and by utilizing them in the design of the Chao Phya powerplant.

International Cooperation

Demands upon the Bureau for technical assistance in the foreign-aid programs increased throughout the year. Various services were made available to other countries, notably training, observation, technical studies, technical missions, and engineering information.

Prominent foreign visitors to the Bureau included King Faisal II of Iraq with retinue; the Thailand Minister of Agriculture, Rear Adm. Luang Sunawin Vivadh; L. R. East, chairman, State rivers and water supply commission of Australia; Hui Huang, president of the Taiwan Power Co., Formosa; Governor Ayash of North Lebanon; and Francisco Saboya Albuquerque, Director General of National Departments of Drought Works, Brazil.

The Division distributed 72 sets of technical materials covering a diversity of subjects in reclamation engineering to technical centers in 20 TCA countries.

Construction Costs

Construction costs on Bureau of Reclamation work increased about 3½ percent during the fiscal year. Virtually all of this increase could be attributed to an 8-percent rise in the basic wage rates. This rise was partially offset by increased production and decreased costs resulting from less overtime work.

Increased bidding interest in all types of reclamation work was evident during the year. On 20 construction specification schedules issued by the Design and Construction Division during the first quarter of the fiscal year, an average of 4.5 bids was received on each schedule. During the last half of the year an average of 7 bids was received on each schedule advertised. This increased competitive interest was reflected by favorable prices and resulted in substantial savings.

Table 3 shows cost indexes for Bureau of Reclamation construction work based on the combined costs of materials and labor supplied by contractors and material and labor supplied by the Government.

TABLE 3.—Bureau of Reclamation construction cost indexes—fiscal year 1953

Cost indexes based on January 1940 costs =1.00	July 1952	January 1953	June 1953
Dams:			
Earth	2.20	2.15	2.20
Concrete	2.25	2.25	2.30
Pumping plants:			
Building and equipment	2.45	2.45	2.45
Structures and improvements [1]	2.65	2.70	2.70
Equipment	2.20	2.20	2.25
Pumps and prime movers	2.20	2.30	2.30
Accessory electric and miscellaneous equipment	2.20	2.10	2.15
Discharge pipes	2.60	2.65	2.70
Canals and conduits:			
Canals	2.50	2.55	2.45
Conduits (tunnels, free flow, concrete lined)	2.60	2.55	2.55
Laterals and drains	2.70	2.75	2.90
Powerplants, hydroelectric:			
Building and equipment	2.35	2.40	2.40
Structures and improvements [1]	2.65	2.65	2.70
Equipment	2.20	2.25	2.30
Turbines and generators	2.20	2.30	2.30
Accessory electrical equipment	2.20	2.10	2.20
Miscellaneous equipment	2.20	2.25	2.25
Penstocks	2.60	2.65	2.70
Transmission switchyards and substations	2.25	2.25	2.40
Transmission lines (wood pole)	2.30	2.25	2.20
Transmission lines (steel tower)	2.15	2.20	2.25
Permanent general property: Buildings	2.60	2.55	2.60
Roads and bridges:			
Primary roads	2.35	2.45	2.50
Secondary roads, unsurfaced	2.25	2.35	2.25
Bridges	2.50	2.60	2.70
Composite index	2.40	2.40	2.45

[1] Indexes for structures and improvements on pumping plants and powerplants are based on reinforced concrete structures.

Publications

The first printed editions of the Welding Manual and the Water Measurement Manual and a reprint of the fifth edition of the Concrete Manual were issued during the year.

Seven engineering monographs were issued during the year. These describe the theory and problems of water percolation, reinforced concrete-design data, hydrodynamic pressures on dams resulting from earthquakes, the estimating of structure foundation settlements by consolidation tests, hydraulic-laboratory practices, and the technique of multiple correlation in forecasting seasonal runoff. Also published were three technical memoranda covering the subject of seepage studies in canals, influence of soil properties and construction methods on the performance of earth dams, and pressure grouting.

Preparation of the third edition of Dams and Control Works was completed during the year. This publication discusses the Bureau's experience in the design and construction of dams, spillways, and outlet works, as well as the scope of reclamation engineering.

Additional publications issued during the year included a handbook on canal safety and a reprint of a pamphlet on labor relations in reclamation construction.

A comprehensive report on Davis Dam was completed, and assembly of data for reports on 30 additional structures proceeded during the year.

TABLE 4.—United States Department of the Interior, Bureau of Reclamation storage dams, June 30, 1953

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Arizona:								
Salt River	Bartlett	Verde	Concrete multiple-arch	[1] 179, 500	287	1, 063	182, 000	1939
	Cave Creek [2]	Cave Creek	do	11. 000	109	1, 648	18, 775	1923
	Horse Mesa	Salt	Concrete arch, powerplant	[1] 245, 100	300	803	162, 000	1927
	Mormon Flat	do	do	[1] 57, 900	224	505	59, 900	1925
	Roosevelt	do	Masonry arch-gravity, powerplant.	[1] 1, 398, 000	280	1, 125	355, 800	1911
	Stewart Mountain	do	Concrete arch, powerplant	69, 800	207	1, 260	120, 500	1930
Arizona-California:								
Parker Dam power	Parker [2]	Colorado	do	717, 000	320	856	380, 000	1938
Arizona-Nevada:								
Boulder Canyon	Hoover (Boulder)	do	Concrete arch-gravity, 2 powerplants.	31, 142, 000	726	1, 244	4, 400, 000	1936
Davis Dam	Davis	do	Earth, powerplant	1, 820, 000	200	1, 600	4, 357, 500	1950
California:								
Cachuma	Cachuma	Santa Ynez	Earth	232, 000	275	2, 975	6, 600, 000	1953
	Glen Anne	Offstream	do	500	102	240	121, 000	1953
	Lauro	do	do	642	110	540	472, 000	1952
Central Valley	Friant [2]	San Joaquin	Concrete gravity	521, 000	319	3, 488	2, 135, 000	1942
	Keswick [3]	Sacramento	do	23, 800	159	1, 046	197, 000	1945
	Martinez	Offstream	Earth		38	1, 200	183, 450	1947
	Nimbus	American	Earth, concrete overflow section	7, 600	76	1, 093	205, 000	(4)
	Shasta	Sacramento	Concrete curved-gravity, embankment wing, powerplant.	4, 493, 000	602	3, 460	6, 541, 000	1945
	Sly Park	Sly Park Creek	Earth, rock	47, 130	190	760	657, 000	(4)
Orland	East Park	Little Stony Creek	Concrete arch-gravity	51, 000	139	226	15, 745	1910
	Stony Gorge	Stony Creek	Concrete slab-and-buttress	[1] 50, 200	139	868	43, 100	1928
Colorado:								
Colorado-Big Thompson	Carter Lake	Offstream	Earth (2 dikes)	117, 000	200	1, 235	2, 900, 000	1952
	Dixon Canyon	do	Earth	(5)	240	1, 215	3. 004, 000	1949
	Flatiron	do	do	19, 000	70	1, 730	364, 500	(4)
	Granby	Colorado	do	546, 000	245	885	2, 901, 300	1950
	Green Mountain	Blue	Earth, powerplant	154, 600	300	1, 150	4, 406, 000	1943
	Horsetooth	Offstream	Earth	147, 000	150	1, 610	1, 890, 000	1949
	Marys Lake [3]	do	Earth (2 dikes), powerplant	700	40	1, 300	60, 500	1950
	Olympus [2]	Big Thompson	Concrete gravity, embankment wing.	2, 850	60	1, 850	300, 000	1949
	Rattlesnake	Offstream	Earth	2, 000	105	1, 080	408, 000	1952
	Shadow Mountain	Colorado	do	15, 000	44	600	210. 000	1946
	Soldier Canyon	Offstream	do	(5)	220	1, 420	3, 288, 000	1949
	Spring Canyon	do	do	(5)	215	1, 115	2, 213, 000	1948
	Willow Creek	Willow Creek	do	11, 150	135	1, 075	384, 000	1953
Fruitgrowers Dam	Fruitgrowers	Alfalfa Run	do	4, 600	55	1, 520	135, 500	1938
Mancos	Jackson Gulch	Offstream	do	10, 000	181	1, 895	1, 988, 000	1948
Pine River	Vallecito	Pine	do	129, 700	162	4, 010	3, 738, 000	1947
Uncompahgre	Taylor Park	Taylor	do	[1] 106, 200	206	675	1, 115, 100	1931
San Luis Valley	Platoro	Conejos	do	60, 000	165	1, 538	909, 884	(4)

Idaho:								
Minidoka	American Falls	Snake	Concrete gravity, embankment wings.	[1] 1,700,000	94	5,227	313,600	1927
	Jackson Lake	do	do	[1] 847,000	70	4,920	491,700	1911
	Minidoka [2]	do	Earth with concrete, powerhouse section, powerplant.	[1] 95,200	86	4,475	257,300	1906
	Grassy Lake	Grassy Lake	Earth	15,500	118	1,170	541,600	1939
	Island Park	Snake, Henry's Fork	do	127,600	91	9,448	464,000	1938
Idaho-Oregon:								
Boise	Anderson Ranch	Boise, North Fork	Earth, powerplant	498,200	456	1,350	9,653,300	1950
	Arrowrock	Boise	Concrete arch-gravity	[1] 286,600	354	1,150	636,000	1915
	Cascade	Fayette, North Fork	Earth	700,000	107	785	395,000	1948
	Deadwood	Deadwood	Concrete arch	164,000	165	749	56,400	1931
	Deer Flat, Upper	Offstream	Earth	190,100	74	4,000	1,245,000	1908
	Deer Flat, Lower	do	do		46	7,200	1,240,000	1908
	Deer Flat, Middle	do	do		16	950	22,500	1908
Idaho-Wyoming:								
Palisades	Palisades	South Fork, Snake River.	do	1,417,600	260	2,100	13,571,000	(4)
Kansas:								
Smoky Hill Division (Missouri River Basin).	Cedar Bluff	Smoky Hill	do	368,100	204	11,000	8,917,000	1951
Kansas-Colorado:								
Solomon Division (Missouri River Basin).	Kirwin	North Fork, Solomon River.	do	315,000	170	12,600	9,180,000	(4)
	Webster	Solomon River	Earth, rock	(4)	108	10,600	5,500,000	(4)
St. Francis (Missouri River Basin)	Bonny	South Fork, Republican River.	do	175,000	160	9,265	8,530,000	1951
Montana:								
Bitter Root	Como	Rock Creek	do	34,800	65	2,550	1,106,000	1910
Hungry Horse	Hungry Horse	Flathead, South Fork	Concrete arch-gravity, powerplant.	3,500,000	564	2,115	2,900,000	1952
Huntley	Anita	Offstream	Earth	[1] 400	42	1,050	142,800	1937
Milk River	Fresno	Milk	do	129,100	111	2,070	2,105,000	1939
	Nelson	Offstream	Earth (5 dikes)	85,500	28	9,900	232,600	1915
	Sherburne Lakes	Swiftcurrent Creek	Earth	[1] 66,100	96	1,086	227,600	1921
Sun River	Gibson	Sun, North Fork	Concrete arch	[1] 105,000	196	960	167,500	1929
	Pishkun	Offstream	Earth (8 dikes)	46,400	50	9,180	599,300	1921
	Willow Creek	Willow Creek	Earth, semihydraulic fill	[1] 32,400	93	650	254,186	1911
Helena-Great Falls Division (Missouri River Basin).	Canyon Ferry	Missouri River	Concrete gravity	2,050,000	220	1,010	455,600	(4)
Lower Marias Division (Missouri River Basin).	Tiber	Missouri River	Earth, rock	1,397,000	205	4,300	5,375,000	(4)

See footnotes at end of table.

TABLE 4.—United States Department of the Interior, Bureau of Reclamation storage dams, June 30, 1953—Continued

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Nebraska:								
Frenchman-Cambridge Division (Missouri River Basin).	Enders	Frenchman Creek	Earth	74,000	134	2,603	1,951,000	1950
	Trenton	Republican	do	172,000	95	7,800	(6)	(4)
Mirage Flats	Box Butte	Niobrara	do	31,300	87	5,508	1,422,000	1946
	Medicine Creek	Medicine Creek	do	93,000	180	5,630	2,883,000	1950
Nebraska-Wyoming:								
North Platte	Guernsey	North Platte	Earth, powerplant	48,100	135	560	586,200	1927
	Lake Alice, upper	Offstream	Earth	11,400	30	3,100	240,600	1913
	Lake Alice, lower	do	do		23	2,550	119,000	1912
	Minatare	do	do	[1] 60,800	63	3,700	696,100	1915
	Pathfinder	North Platte	Masonry arch-gravity	[1] 1,070,000	214	1,070	65,700	1909
	Pathfinder dike	do	Earth		38	1,650	152,200	1909
Nevada:								
Humboldt	Rye Patch	Humboldt	do	[1] 179,000	80	914	356,300	1936
Newlands	Lahontan	Garson	Earth, powerplant	[1] 273,600	162	5,400	733,100	1915
	Lake Tahoe [2]	Truckee	Concrete slab-and-buttress, lake outlet regulator.	[1] 732,000	16	109	430	1913
Nevada-California:								
Truckee Storage	Boca	Little Truckee	Earth	41,200	116	1,629	911,900	1939
New Mexico:								
Carlsbad	Alamogordo	Pecos	Earth and rockfill	156,800	148	3,084	1,914,900	1937
	Avalon [2]	do	Earth	7,000	58	1,025	202,300	1891
	McMillan	do	do	38,700	57	2,114	234,000	1894
New Mexico-Texas:								
Rio Grande	Caballo [2]	Rio Grande	do	340,850	112	4,558	1,244,200	1938
	Elephant Butte	do	Concrete gravity, powerplant (1940).	[1] 2,185,400	301	1,674	629,500	1916
North Dakota:								
Heart Division (Missouri River Basin).	Heart Butte	Heart River	Earth	450,000	174	1,850	1,222,000	1949
	Dickinson	do	do	16,500	69	2,225	326,000	1950
Missouri-Souris Division (MRB)	Jamestown	James	do	1,460	100	1,400	960,000	(4)
Oklahoma:								
W. C. Austin	Altus [2]	Red, North Fork	Concrete gravity, masonry-faced.	[1] 151,700	110	1,112	70,200	1945
Oregon:								
Baker	Thief Valley	Powder	Concrete slab-and-buttress	17,400	70	390	6,288	1932
Burnt River	Unity	Burnt	Earth, rock-faced	25,800	83	675	253,600	1938
Deschutes	Crane Prairie	Deschutes	Earth	55,300	36	285	29,700	1940
	Wickiup	do	do	180,000	100	13,860	1,852,000	1949
	Wickiup-East Dike	do	do		28	3,420		1949
Umatilla	Cold Springs	Offstream	do	[1] 50,000	117	3,450	793,400	1908
	McKay	McKay Creek	Earth, concrete-faced	[1] 73,800	180	2,700	2,363,800	1927
Vale	Agency Valley	Malheur, North Fork	Earth	59,900	110	1,850	645,300	1935
	Warm Springs	Malheur, Middle Fork	Concrete arch	192,400	106	469	19,500	1919

Oregon-California:								
Klamath	Clear Lake	Lost	Earth	527,000	39	840	63,400	1910
	Gerber	Miller Creek	Concrete arch	[1] 94,300	88	485	11,900	1925
	Link River	Link	Concrete slab-and-buttress, lake outlet regulator.	[1] 873,000	22	435	2,200	1921
Oregon-Idaho:								
Owyhee	Owyhee [2]	Owyhee	Concrete arch-gravity	1,120,000	417	833	537,500	1932
South Dakota:								
Cheyenne Division (Missouri River Basin).	Angostura	Cheyenne	Concrete gravity, embankment wing.	220,000	187	1,900	749,600	1949
	Pectola	Rapid Creek	Earth, rock	99,000	230	1,340	2,400,000	(4)
Belle Fourche	Belle Fourche	Owl Creek	Earth, concrete-faced	[1] 177,500	122	6,262	1,783,200	1911
Rapid Valley	Deerfield	Castle Creek	Earth	15,700	133	825	607,400	1947
Grand Division (Missouri River Basin).	Shadehill	Grand	do	467,000	145	1,900	3,500,000	1951
Texas:								
Colorado River	Marshall Ford	Colorado (Texas)	Concrete gravity, embankment wings, powerplant.	1,951,300	278	5,093	3,579,000	1942
Utah:								
Hyrum	Hyrum [2]	Little Bear	Earth	18,800	116	540	435,600	1935
Moon Lake	Midview	Offstream	do	5,800	54	663	138,900	1937
	Moon Lake	Lake Fork, West Fork	do	[1] 35,800	110	1,108	513,100	1938
Newton	Newton	Clarkson Creek	do	5,500	101	4,781	410,060	1946
Ogden River	Pine View	Ogden	do	43,600	103	480	267,700	1937
Provo River	Deer Creek	Provo	do	152,600	235	1,304	2,827,900	1941
Scofield	Scofield	Price	do	73,000	125	575	202,700	1946
Strawberry Valley	Strawberry	Strawberry	do	283,000	79	488	117,900	1913
Weber River	Echo	Weber	do	73,900	158	1,887	1,539,800	1931
Washington:								
Columbia Basin	Grand Coulee	Columbia	Concrete gravity, 2 power plants and pumping plant.	9,517,000	550	4,173	10,585,000	1942
	Dry Falls	Offstream	Earth	1,484,000	94	9,800	1,605,000	1949
	North	do	do		145	1,400	1,228,000	1951
	Long Lake	do	do	62,700	130	1,900	1,489,000	1948
	O'Sullivan	Lower Crab Creek	do	606,000	200	19,000	9,245,000	1949
Okanogan	Conconully	Salmon Creek	Earth, hydraulic fill	[1] 13,000	70	1,000	359,000	1910
	Salmon Lake	do	Earth	[1] 10,500	42	1,260	194,900	1921
Yakima	Bumping Lake	Bumping	do	37,300	45	3,660	252,600	1910
	Clear Creek	Tieton, North Fork	Concrete arch	5,300	80	404	5,800	1914
	Cle Elum	Cle Elum	Earth	529,200	135	750	1,411,300	1933
	Kachess	Kachess	do	[1] 239,000	114	1,400	199,600	1912
	Keechelus	Yakima	do	170,500	103	6,550	683,500	1917
	Tieton	Tieton	Earth, semihydraulic fill	[1] 197,000	235	920	2,048,600	1925
Wyoming:								
Boysen Division (Missouri River Basin).	Boysen	Big Horn	Earth, powerplant	1,493,000	220	1,000	1,689,000	1952
Cheyenne Division (Missouri River Basin).	Keyhole	Belle Fourche	Earth	510,000	165	3,420	1,300,000	1952
Eden	Big Sandy	Big Sandy Creek	do	65,000	80	2,300	840,000	1952
Kendrick	Alcova [2]	North Platte	do	190,700	265	763	1,635,300	1938
	Seminoe	do	Concrete arch, powerplant	[1] 1,026,000	295	530	210,200	1939

See footnotes at end of table.

TABLE 4.—United States Department of the Interior, Bureau of Reclamation storage dams, June 30, 1953—Continued

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Wyoming—Continued								
Oregon Trail Division (Missouri River Basin).	Kortes [3]	North Platte	Concrete gravity, powerplant	4, 800	240	440	147, 000	1951
Riverton	Bull Lake	Bull Lake Creek	Earth	[1] 152, 000	81	3, 456	819, 600	1938
	Pilot Butte	Offstream	Earth, semihydraulic fill	[1] 31, 600	51	1, 300	135, 300	1926
Wyoming-Montana:								
Shoshone	Deaver	do	Earth	680	14	1, 300	30, 300	1918
	Ralston	do	do	1, 500	35	2, 200	24, 700	1908
	Buffalo Bill	Shoshone	Concrete arch, powerplant	456, 600	325	200	82, 900	1910

[1] Live storage—dead storage not evaluated.
[2] Storage and diversion.
[3] Power dam—water supply for generation of power.
[4] Under construction.
[5] Horsetooth Reservoir formed by 4 dams.
[6] Not available.

DEFINITIONS

Capacity: Acre-feet of reservoir storage provided by highest controlled water surface.

Height: Feet between lowest point in foundation and normal crest of dam.

Length: Feet of barrier in dam and integral features constructed between natural abutments.

Volume: Cubic yards of all material in dam and its appurtenant features.

Year: Date original construction was completed. (Other tabular data include supplemental construction.)

TABLE 4a.—United States Department of the Interior, Bureau of Reclamation diversion dams, June 30, 1953

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Arizona:								
Salt River	Granite Reef	Salt	Concrete weir	3, 600	18	1, 128	35, 000	1908
	Joint Head	do	Concrete weir, embankment wing	200	4	2, 600	5, 400	1914
	Power Canal	do	do	220	8	862	16, 000	1906
Arizona-California:								
Gila & Boulder Canyon, All-American Canal System.	Imperial	Colorado	Concrete slab-and-buttress weir, desilting works.	17, 160	23	3, 475	196, 790	1938
Yuma	Laguna	do	Rockfill weir, concrete-surfaced	1, 950	10	4, 780	486, 800	1909
California:								
Orland	East Park Feed Canal	Stony Creek	Concrete arch, overflow	200	28	271	1, 777	1914
	Northside	do	Concrete weir, removable crest	80	3	375	270	1913
	Southside	do	Concrete weir	140	3	895	3, 600	1916
Central Valley	Camp Creek	Camp Creek	Concrete, overflow weir	500	20	[1] 43	3, 000	(2)
Colorado:								
Fruitgrowers Dam	Dry Creek	Dry Creek	Concrete weir	100	5	36	242	1940
Grand Valley	Grand Valley	Colorado	Concrete weir, movable crest	1, 425	14	543	17, 990	1916
Uncompahgre	East Canal	Uncompahgre	Concrete weir, embankment wing	330	8	764	1, 009	1915
	Garnet	do	Rockfill weir, concrete-surfaced	50	4	75	500	(3)
	Gunnison	Gunnison	Timber-crib weir, concrete wings, removable crest.	1, 000	10	244	3, 200	1912
	Ironstone	Uncompahgre	Concrete gate-structure, timber-crib wing.	350	8	[1] 31	155	(3)
	Loutsenhizer	do	Timber weir	290	9	114	400	[3] 1883
	Montrose and Delta	do	Concrete gate-structure, movable crest.	450	12	68	500	[3] 1883
	Selig	do	Timber weir, removable crest	300	10	96	500	(3)
Colorado-Big Thompson	North Poudre	Cache la Poudre	Concrete weir, embankment wing.	250	18. 5	200	8, 700	1950
Idaho:								
Lewiston Orchards	Sweetwater	Sweetwater Creek	Rockfill weir, concrete diaphragm.	77	8	80	400	1948
	Webb Creek	Webb Creek	do	20	10	75	600	1948
Idaho-Oregon:								
Boise	Black Canyon [4]	Payette	Concrete gravity, overflow, removable crest, powerplant.	1, 360	111	1, 039	81, 204	1925
	Boise River	Boise	Concrete and masonry weir, removable crest, powerplant.	2, 815	39	500	26, 100	1908
Idaho-Wyoming:								
Minidoka	Cascade Creek	Cascade Creek	Timber-crib weir, removable crest.	220	6	217	3, 068	1937
	Cross Cut	Henry's Fork	Concrete weir	590	10	457	7, 375	1937
Montana:								
Bitter Root	Rock Creek	Rock Creek	Timber-crib weir	320	6	30	150	[3] 1910
Frenchtown	Frenchtown	Missoula	Earth (includes 3 dikes), nonoverflow.	170	13	489	12, 176	1936

See footnotes at end of table.

TABLE 4a.—United States Department of the Interior, Bureau of Reclamation diversion dams, June 30, 1953—Continued

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Montana—Continued								
Huntley	Yellowstone River	Yellowstone	Concrete weir	400	8	250	1, 674	1934
Milk River	Dodson	Milk	Timber-crib weir, removable crest, embankment wings.	1, 450	22	8, 154	87, 355	1910
	Saint Mary	Saint Mary	Concrete weir	530	6	198	1, 230	1915
	Swift Current	Swift Current Creek	Earth, timber-crib core, nonoverflow.	------	13	1, 800	98, 400	1915
	Vandalia	Milk	Concrete slab-and-buttress weir, movable crest, embankment wing.	250	32	2, 350	15, 207	1917
Sun River	Sun River	Sun, North Fork	Concrete arch, overflow	1, 400	114	261	6, 466	1915
Missouri Diversion Unit (MRB)	Missouri Diversion	Missouri	Concrete weir, embankment wing.	2, 200	30	13, 500	980, 000	(2)
Montana-North Dakota:								
Lower Yellowstone	Lower Yellowstone	Yellowstone	Timber-crib weir, embankment wings.	840	4	800	22, 500	1910
Nebraska:								
Bostwick Division (MRB)	Superior-Courtland	Republican	Concrete ogee weir, embankment wings.	169	21	8, 075	178, 000	1950
Mirage Flats	Dunlap	Niobrara	Concrete weir, embankment wing.	220	6	577	5, 100	1945
Frenchman-Cambridge (MRB)	Cambridge	Republican	do	------	33	------	13, 850	1948
	Bartley	do	do	130	35	1, 015	58, 000	(2)
Nebraska-Wyoming:								
North Platte	Horse Creek	Horse Creek	do	430	6	720	5, 260	1923
	Whalen	North Platte	do	3, 700	11	2, 460	81, 700	1909
Nevada:								
Newlands	Carson River	Carson	Concrete gate-structure	1, 950	14	241	2, 707	1905
	Derby	Truckee	Concrete gate-structure, embankment wing.	1, 500	15	1, 331	36, 572	1905
New Mexico-Texas:								
Rio Grande	American [5]	Rio Grande	Concrete weir, movable crest, embankment wings.	1, 110	5	9, 306	67, 667	[3] 1938
	Leasburg	do	Concrete weir, embankment wing.	600	6	2, 865	22, 500	1908
	Messilla	do	do	890	4	3, 445	23, 600	1916
	Percha	do	Concrete weir, movable crest, embankment wings.	350	9	2, 720	43, 238	1917
	Percha Arroyo	Percha Arroyo	Earth, nonoverflow	30, 000	19	2, 489	192, 884	1939
	Riverside	Rio Grande	Concrete weir, movable crest, embankment wings.	1, 000	6	3, 370	145, 150	1928
Fort Sumner	Fort Sumner	Pecos	Concrete weir	100	35	715	24, 660	1951
Oregon:								
Deschutes	North Canal	Deschutes	Concrete arch-gravity, overflow	1, 000	28	293	[6] 4, 900	[3] 1912
Umatilla	Feed Canal	Umatilla	Concrete weir, embankment wing.	350	4	2, 100	14, 100	1907

	Maxwell	do	Concrete and timber-crib weir, embankment wing.	140	5	400	464	1915
	Three Mile Falls	do	Concrete multiple-arch, overflow.	360	23	915	5, 068	1914
Vale	Harper	Malheur	Concrete gate-structure, embankment wing.	660	21	914	9, 258	1929
Oregon-California:								
Klamath	Lost River	Lost	Concrete multiple-arch, overflow, embankment wings.	1, 200	26	675	19, 915	1912
	Lower Lost River	do	Concrete slab-and-buttress	810	12	324	689	1921
	Malone	do	Concrete gate-structure, embankment wing.		18	515	24, 600	1923
	Miller	Miller Creek	Concrete weir, removable crest, embankment wings.		5	290	1, 615	1924
South Dakota:								
Belle Fourche	Belle Fourche	Belle Fourche	Concrete weir, embankment wing.	1, 635	18	2, 523	35, 700	1907
Utah:								
Hyrum	Hyrum	Little Bear, East Fork	Rockfill weir, embankment wing.	90	1	520	2, 900	1937
Moon Lake	Duchesne Feeder Canal.	Duchesne	Concrete weir, embankment wings.	200	6	[1] 220	4, 000	1939
Provo River	Weber River	Weber	do	1, 000	10	1, 795	15, 400	1931
Strawberry Valley	Indian Creek Crossing.	Indian Creek	do	750	9	1, 350	15, 200	1913
	Spanish Fork	Spanish Fork	Concrete weir	500	13	74	1, 300	1908
Washington:								
Okanogan	Salmon Creek	Salmon Creek	Concrete weir, embankment wing.	300	5	130	800	1909
Yakima	Easton [4]	Yakima	Concrete gravity, overflow, movable crest.	1, 320	51	248	5, 760	1929
	Prosser [7]	do	Concrete weir	(7)	6	768	1, 026	[3] 1904
	Roza	do	Concrete weir, movable crest	2, 200	34	486	21, 711	1939
	Sunnyside	do	Concrete weir, embankment wing.	1, 320	6	[1] 500	1, 809	1907
	Tieton	Tieton	do	320	2	510	1, 368	1908
Wyoming:								
Riverton	Wind River	Wind River	do	2, 200	19	2, 464	123, 860	1923
Shoshone	Corbett	Shoshone	Concrete slab-and-buttress weir, embankment wing.	1, 000	12	938	10, 200	1908
	Willwood	do	Concrete gravity, overflow, embankment wing.	320	41	476	22, 119	1924

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[1] Overflow—Length of overflow section only.
[2] Under construction—Advance data, subject to revision.
[3] NonReclamation construction.
[4] Storage and diversion—Dam classified according to its principal feature.
[5] Contributory dam—NonReclamation, furnishing water supply or power for irrigation of Bureau of Reclamation projects.
[6] Dam—Indicates data applicable to dam only.
[7] Power dam—Water supply for generation of power.

DEFINITIONS

Capacity: Second-feet of diversion provided by canal headworks at dam.
Height: Feet between original streambed and highest controlled water surface.
Length: Feet of barrier in dam and integral features constructed between natural abutments.
Volume: Cubic yards of all material in dam and its appurtenant features.
Year: Date original construction was completed.

FOREIGN ACTIVITIES

The Bureau of Reclamation during fiscal year 1953 received an increased number of requests for technical assistance to underdeveloped areas of the world. The Office of Foreign Activities is responsible for administering the Bureau's participation in these programs. The sending of individual specialists and missions of Bureau technicians to other countries is carried out primarily in cooperation with the Technical Cooperation Administration which during the fiscal year was an agency of the Department of State. Such assistance is also rendered in conjunction with the programs of the Mutual Security Agency. The training of technicians from foreign lands and rendering service to observers and visitors are performed under the auspices of both MSA and TCA. Incidental to benefiting underdeveloped countries of the free world, the domestic program of the Bureau of Reclamation also reaps benefits from the exchanges of technical information in the field of water-resource development, and by the experience gained by the Bureau technicians engaged in this work abroad.

During fiscal year 1953, 550 foreign officials and engineers representing 56 nations, visited the Washington and Denver offices of the Bureau of Reclamation by request of the Department of State, Mutual Security Agency, UNESCO, and other agencies directly concerned with the foreign-aid program. This number does not include hundreds of foreign visitors and tourists who visit Bureau projects to take advantage of the public-tour services provided.

Included in the number of official visitors were 208 in-service trainees and official observers who studied engineering and administration in the Denver engineering offices and laboratories, and at other Bureau installations.

During fiscal year 1953, the Bureau continued to make substantial contributions of missions and specialists in response to requests from numerous foreign governments, which requests were approved either by TCA or MSA.

Under the TCA programs, 75 Bureau employees were on technical assistance assignments to Afghanistan, Chile, Colombia, Costa Rica, Egypt, Ethiopia, Liberia, India, Iran, Iraq, Israel, Jordan, Lebanon, Libya, Nicaragua, and Pakistan; 22 of these employees form a special mission in Lebanon on the Litani River project.

Through arrangements with MSA, eight Bureau specialists went on assignments to Thailand and Formosa. During the concluding months of the year, the Bureau was requested to furnish an additional 50 specialists and engineers to carry out specific assignments in many of the above countries. As the year ended, a substantial portion of this recruitment had been accomplished.

During the fiscal year the Bureau received $2,438,000 from outside sources to finance its contributions to technical assistance endeavors.

This may be compared with $1,845,000 for 1952, and $247,000 for the 1951 fiscal year.

The Bureau also continued its service of performing technical services such as testing, research, and design review for foreign water resource development projects under provisions of Public Law 402, 80th Congress. Most of this work is performed in the Design and Construction Division, Denver. Perhaps the most striking example of this type of technical-assistance activity is the Bureau's assistance to the Snowy Mountains Hydroelectric Authority of Australia in the development of the waters of southeastern Australia for irrigation, power, and industrial purposes. The Bureau prepared specifications for a large tunnel and related works estimated to cost $120 million, and further assistance in the development of the resources of this area is likely.

Other activities under Public Law 402 included: Assignment of two Bureau specialists to investigate ground-water possibilities in the Elqui Valley of northern Chile; continuing review for the Government of Thailand of the designs of the Chao Phya Dam, a multipurpose structure for development of the Chao Phya River; assignment of one engineer to Japan at the request of the United Nations; and a program of stress studies, hydrologic-model testing, turbine-design review, and other engineering work for the Central Water and Power Commission of India.

OPERATION AND MAINTENANCE

The Division of Operation and Maintenance is responsible for the delivery of irrigation water to lands on 71 operating projects which again set another record-breaking agricultural crop-production year. The Division is also responsible for the protection of the Federal investment in constructed works on these developments through proper supervision.

The works include 116 storage and 74 diversion dams, more than 18,500 miles of canals and laterals, 5,600 miles of drains, 354 major pumping plants, and an estimated 11,000 miles of operating roads.

There are more than 100,000 farms on these projects, located in the 17 Western States, consisting of approximately 7 million acres on which 400,000 settlers live. About 1,600,000 persons, who are directly dependent upon the reclamation program, live in project towns and villages. In addition to these, 2 million persons engaged in manufacturing, marketing, transportation, and other services throughout the United States owe their livelihood to the reclamation program.

Extension of Irrigation Service

The 1952 total of irrigable land in the service area of reclamation projects reached 6,994,478 acres. This is an increase of 281,463 irrigable acres over the 6,713,015 acres reported in 1951. Nearly one-half of the increase came through the extension of irrigation service on the Central Valley project in California and the opening of the first major irrigation block on the Columbia Basin project in Washington. Significant additions were also reported through the extension of irrigation service to three new units of the Missouri River Basin project, the Heart Butte unit of the Heart Division in North Dakota, and the Superior-Courtland unit of the Bostwick Division and the Frenchman-Cambridge Division, both in Nebraska. In all, 21 projects or divisions of projects reported increased acreages in the project service areas.

Federal land units were made available to 263 veterans under the provisions of the various preference acts. The major number of these units were located on the Columbia Basin project with 191 units. The others were located on the Minidoka project where 72 public-land units were opened to veterans' settlement.

Crop Production

For the first time in reclamation history the gross crop value of a single reclamation harvest approached the $1 billion mark. The $935,679,755 crop constituted an increase of $113,958,000 over the previous year's $821,721,665 harvest.

The 1952 harvest marked the seventh consecutive year of crop values in excess of the one-half billion dollar mark and brought the cumulative value of all reclamation harvests through 1952 to more than $8.9 billion. 1952 also established a record in terms of the average per acre value reaching $155.26 for an increase of nearly $17 per acre over the $138.29 reported for 1951.

The record crop production is shown project-by-project in table 5 on page 144. Highlights of achievement contained in reports from the Bureau's regional offices include the following:

Crop production on Federal reclamation projects in the Northwest rose to a record high of $270,212,832 in calendar year 1952, or $38,966,412 over the previous all-time high. Total cumulative gross returns from the region now exceed $3½ billion. Large acreages planted to onions and potatoes on two projects were primarily responsible for the year's record production.

All originally authorized features of the Central Valley project were in operation during the fiscal year.

Crops valued at $223,319,741 were produced in 1952 on region 3 projects receiving full or supplemental water supply from reclamation constructed facilities. Dollarwise, the 1952 crop value was highest on record, exceeding the previous high in 1951 by 10 percent.

Twenty operating reclamation projects in region 4 reported a 1952 crop value of $43,634,000 from 534,000 acres of irrigated land. This compared to a value of $39,167,000 from 533,000 acres the previous year.

Operation and maintenance of all features of the Deer Creek division of the Provo River project except the Deer Creek Dam and Provo River channel revision were assumed by the water users beginning May 1, 1953.

On 6 projects, 274,000 acres of cropland were irrigated in the crop year of 1952, producing crops valued at $73,105,000, an average of $266.52 per acre. This is the highest crop value ever produced on the projects in region 5, and is primarily the result of a shift to higher value crops on all projects, including an increased acreage of long-staple cotton on the Rio Grande project.

The 12 operating projects in region 6, receiving a full water supply from Bureau works, produced crops in 1952 worth $23,285,000 from a net area under cultivation of 454,366 acres. In 1951, the comparable value of crop production was $19,733,619 from 455,548 acres.

The total gross crop value from the irrigated lands supplied water from Bureau constructed works was $109,280,000 for the calendar year 1952, $20,243,000 of which was from lands receiving their full supply of water service and $89,037,000 was from lands receiving supplemental water from reclamation works.

Full water service was supplied to 4,100 acres of new lands for the first time last year, and there was also an increase of about 40,000 acre-feet of supplemental water service.

The harvest of 1952 was made up of 23,606,400 tons of food, forage, and fiber and was over 1½ million tons greater than the 1951 harvest. Of the total, 52.9 percent (12,484,619 tons) was in hay, pasture, forage, and cereal groups, 26.5 percent (6,268,744 tons) was in field crops and seeds, and 20.6 percent (4,853,054 tons) was in vegetables, truck, fruit, and nut groups. In terms of acres, the most significant crop group was hay and forage with 44 percent of all irrigated lands producing these crops. The 10,837,700-ton harvest of these crops contributed materially to the orderly use of the 700-million-acre western range.

The most significant individual crop produced in 1952 was cotton which made up approximately 25 percent of total crop value and utilized about 11 percent of the irrigated land. Highest per acre values were reported on the Coachella Division of the Boulder Canyon project and the Central Valley project both in California where nearly 1,400 acres of fresh market tomatoes produced values in excess of $2,600 per acre.

The importance of crop specialties to the reclamation farmer in 1952 is evidenced in the production of nearly 200,000 acres of crops with gross values of $500 per acre and over. In aggregate the value of these crop specialties was over $143.1 million, or $718 per acre.

TABLE 5.—Projects in operation—Irrigation and crop value data for the calendar year 1952

State, project, and subdivision	Full supply projects constructed or rehabilitated by the Bureau								Supplemental supply projects constructed or rehabilitated by the Bureau				
	Irrigable area for service [1]	Irrigated area	Land subject to construction charges			Temporarily suspended land [2]			Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
			Net area in cultivation	Gross crop value		Net area in cultivation	Gross crop value	Value per acre				Total	Per acre
				Total	Per acre								
REGION 1													
Idaho	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*
Lewiston Orchards [3]	3, 523	2, 545	2, 576	518, 349	201. 22								
Minidoka:													
American Falls Reservoir District No. 2	98, 434	83, 042	85, 042	6, 483, 395	76. 24								
Burley Irrigation District	47, 937	44, 376	44, 376	5, 132, 326	115. 66								
Fremont-Madison Irrigation District									112, 000	100, 505	100, 505	12, 492, 488	124. 30
Minidoka Irrigation District	71, 882	63, 370	63, 370	6, 688, 261	105. 54								
Total, Minidoka project	218, 253	190, 788	192, 788	18, 303, 982	94. 94				112, 000	100, 505	100, 505	12, 492, 488	124. 30
Rathdrum Prairie:													
Hayden Lake unit [3]	1, 087	567	574	54, 010	94. 09								
Post Falls unit [3 4]	3, 109	2, 571	2, 650	219, 983	83. 01								
Total, Rathdrum Prairie project	4, 196	3, 138	3, 224	273, 993	84. 99								
Idaho-Oregon													
Boise:													
Big Bend Irrigation District (Oregon)	1, 724	1, 462	1, 462	106, 136	72. 60								
Black Canyon Irrigation District, unit 1	6, 880	6, 502	6, 599	936, 143	141. 86								
Black Canyon Irrigation District, unit 2	51, 760	43, 165	43, 203	2, 844, 631	65. 84								
Boise-Kuna Irrigation District	48, 660	45, 145	45, 332	4, 100, 429	90. 45								
Nampa and Meridian Irrigation District	40, 196	34, 495	34, 566	3, 152, 916	91. 21								
New York Irrigation District	17, 826	14, 279	14, 390	762, 238	52. 97								
Settlers Irrigation District	518												
Wilder Irrigation District	56, 554	50, 324	50, 414	7, 644, 931	151. 64								
Total, Boise project	224, 118	195, 372	195, 966	19, 547, 424	99. 75								

Montana													
Bitter Root [3]	16, 665	16, 226	16, 482	655, 250	39. 76								
Frenchtown	4, 810	2, 826	3, 093	181, 871	58. 80								
Missoula Valley [4]	977	562	601	15, 336	25. 52								
Oregon													
Arnold [3]	4, 343	2, 712	2, 712	217, 824	80. 32								
Baker									7, 312	7, 305	7, 305	275, 380	37. 70
Burnt River									15, 291	15, 240	15, 240	590, 560	38. 75
Deschutes:													
Central Oregon Irrigation District [3]									46, 739	40, 830	41, 967	5, 406, 265	128. 82
North unit	50, 000	47, 851	47, 851	8, 043, 563	168. 10								
Total, Deschutes project	50, 000	47, 851	47, 851	8, 043, 563	168. 10				46, 739	40, 830	41, 967	5, 406, 265	128. 82
Grants Pass [3]	10, 337	6, 718	7, 241	854, 156	117. 96								
Ochoco [3]	8, 500	7, 985	7, 985	1, 509, 671	189. 06								
Umatilla:													
East division	10, 911	5, 931	5, 931	296, 568	50. 00								
West division	7, 246	5, 081	5, 400	277, 561	51. 40								
South division:													
Stanfield Irrigation District [3]									6, 000	5, 095	5, 340	578, 142	108. 27
Westland Irrigation District									8, 270	5, 353	5, 513	343, 874	62. 38
Total, Umatilla project	18, 157	11, 012	11, 331	574, 129	50. 67				14, 270	10, 448	10, 853	922, 016	84. 95
Vale	32, 000	31, 630	31, 630	2, 450, 555	77. 48								
Oregon-Idaho													
Owyhee:													
Advancement Irrigation District	700	606	606	163, 827	270. 34								
Bench Irrigation District	2, 319	2, 243	2, 243	652, 955	291. 11								
Crystal Irrigation District	1, 280	1, 202	1, 202	402, 846	335. 15								
Gem Irrigation District (Idaho)	33, 454	31, 963	31, 933	3, 999, 542	125. 25	450	9, 000	20. 00					
Ontario-Nyssa Irrigation District	5, 831	5, 790	5, 790	1, 564, 700	270. 24								
Owyhee Irrigation District	49, 583	45, 994	45, 994	5, 623, 946	122. 28								
Payette-Oregon Slope Irrigation District	4, 699	4, 349	4, 349	1, 300, 166	298. 96								
Ridgeview Irrigation District	6, 159	5, 904	6, 009	732, 163	121. 84								
Slide Irrigation District	1, 144	1, 094	1, 094	232, 966	212. 95								
Total, Owyhee project	105, 169	99, 145	99, 220	14, 673, 111	147. 88	450	9, 000	20. 00					
Washington													
Columbia Basin:													
East Columbia Basin Irrigation District	26, 444	8, 828	8, 960	2, 774, 865	309. 69								
Quincy-Columbia Basin Irrigation District	39, 609	12, 486	12, 489	993, 380	79. 54								
South Columbia Basin Irrigation District	6, 644	5, 813	5, 612	918, 640	163. 69								
Total, Columbia Basin project	72, 697	27, 127	27, 061	4, 686, 885	173. 20								
Okanogan	5, 347	3, 611	3, 938	1, 602, 578	406. 95								

See footnotes at end of table, p. 162.

TABLE 5.—Projects in operation—Irrigation and crop value data for the calendar year 1952—Continued

State, project, and subdivision	Full supply projects constructed or rehabilitated by the Bureau								Supplemental supply projects constructed or rehabilitated by the Bureau				
	Irrigable area for service [1]	Irrigated area	Land subject to construction charges			Temporarily suspended land [2]			Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
			Net area in cultivation	Gross crop value		Net area in cultivation	Gross crop value	Value per acre				Total	Per acre
				Total	Per acre								
REGION 1—Continued													
Washington—Continued													
Yakima:	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*
Kittitas division	59,610	54,093	54,338	3,787,091	69.70	120	2,400	20.00					
Roza division	72,185	63,508	63,503	14,570,336	229.44	5	105	21.00					
Sunnyside division	103,309	79,080	79,507	14,337,750	180.33	323	18,450	57.12					
Tieton division	27,271	24,426	24,623	10,435,296	423.80								
Total, Yakima project	262,375	221,107	221,971	43,130,473	194.31	448	20,955	46.77					
Total, region 1	1,041,467	870,355	875,670	117,239,150	133.89	898	29,955	33.36	195,612	174,328	175,870	19,686,709	111.94
REGION 2													
California													
Central Valley [5]													
Orland	19,466	17,200	17.200	1,837,022	106.80								
Oregon-California													
Klamath:													
Main division (Oregon)	[6] 40,225	34,616	32,035	4,879.403	152.36	2,829	129,388	45.74					
Tule Lake division (California)	[7] 44,423	42,753	42,949	11,582,069	269.67	51	7,198	141.14					
Total, Klamath project	84,648	77,369	74,984	16,461,472	219.53	2,880	136,586	47.43					
Total, region 2	104,114	94,569	92,184	18,298,494	198.50	2,880	136,586	47.43					
REGION 3													
Arizona													
Gila:													
Wellton-Mohawk division	14,212	14,134	14,212	3,118,404	219.42								

Yuma Mesa division:													
North Gila unit	7, 287	6, 297	6, 332	1, 618, 918	255. 67								
Yuma Mesa unit	20, 251	10, 506	10, 419	1, 362, 711	130 79								
Total, Gila project	41, 750	30, 937	30, 963	6, 100, 033	197. 01								
Salt River	240, 426	218, 395	225, 776	60, 690, 823	268. 81								
Yuma Auxiliary	3, 393	2, 263	2, 263	1, 044, 222	461. 43								
Arizona-California													
Yuma:													
Reservation division:													
Indian lands (California)	7, 743	5, 565	5, 572	1, 386, 743	248. 88								
Bard unit (California)	7, 110	6, 219	6, 325	1, 288, 084	203. 65								
Valley division (Arizona)	51, 510	47, 333	47, 473	16, 413, 962	345. 75								
Total, Yuma project	66, 363	59, 117	59, 370	19, 088, 789	321. 52								
California													
Boulder Canyon:													
All-American Canal system:													
Coachella division	60, 715	36, 531	36, 989	19, 213, 773	519. 45								
Imperial division [8]													
Total, Boulder Canyon project	60, 715	36, 531	36, 989	19, 213, 773	519. 45								
Total, region 3	412, 647	347, 243	355, 361	106, 137, 640	298. 68								
REGION 4													
Colorado													
Fruitgrowers Dam [3]									2, 662	2, 060	2, 060	350, 633	170. 21
Grand Valley:													
Garfield gravity division	30, 444	21, 543	19, 263	1, 858, 253	96. 47	2, 280	108, 313	47. 51					
Orchard Mesa division [3]	10, 027	8, 776	8, 776	2, 114, 217	240. 91								
Total, Grand Valley project	40, 471	30, 319	28, 039	3, 972, 470	141. 68	2, 280	108, 313	47. 51					
Mancos [4]									8, 612	7, 688	7, 688	283, 434	36. 87
Paonia [3]	11, 500	10, 700	10, 800	1, 006, 435	93. 19								
Pine River									35, 766	32, 620	33, 300	1, 032, 058	30. 99
Pine River Indian irrigation									9, 660	9, 321	9, 660	240, 881	24. 94
Uncompahgre	72, 597	57, 290	58, 136	4, 988, 438	85. 81								
Idaho													
Preston Bench [3]									6, 707	4, 540	4, 704	388, 319	82. 55
Nevada													
Humboldt									40, 012	25, 355	25, 365	2, 532, 708	99. 85

See footnotes at end of table, p. 162.

TABLE 5.—Projects in operation—Irrigation and crop value data for the calendar year 1952—Continued

State, project, and subdivision	Full supply projects constructed or rehabilitated by the Bureau								Supplemental supply projects constructed or rehabilitated by the Bureau				
	Irrigable area for service[1]	Irrigated area	Land subject to construction charges			Temporarily suspended land[2]			Irrigable area for service[1]	Irrigated area	Net area in cultivation	Gross crop value	
			Net area in cultivation	Gross crop value		Net area in cultivation	Gross crop value	Value per acre				Total	Per acre
				Total	Per acre								
REGION 4—Continued													
Nevada—Continued													
Newlands:	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*
North Carson division	6,799	4,181	4,091	293,974	71.86	90	900	10.00					
South Carson division	57,331	43,825	43,022	2,747,674	63.87	803	8,030	10.00					
Truckee division	7,535	5,452	5,395	367,403	68.10	57	570	10.00					
Total, Newlands project	71,665	53,458	52,508	3,409,051	64.92	950	9,500	10.00					
Truckee storage									29,370	22,990	22,990	2,344,675	101.99
Utah													
Hyrum									6,606	5,686	5,719	370,128	64.72
Moon Lake									75,256	58,303	58,796	1,492,166	25.38
Newton[4]									2,534	1,738	1,893	130,133	68.74
Ogden River									22,860	16,123	16,132	1,778,315	110.24
Provo River: Deer Creek division									46,609	39,384	40,056	4,602,531	114.90
Sanpete:													
Ephraim division									7,630	6,733	7,133	272,249	38.17
Spring City division									6,023	5,020	5,778	197,025	34.10
Total, Sanpete project									13,653	11,753	12,911	469,274	36.35
Scofield[4]									15,609	13,859	14,868	1,170,272	78.71
Strawberry Valley:													
High Line division	17,695	15,565	16,073	869,620	54.10								
Spanish Fork division	13,846	13,065	13,504	979,314	72.52								
Springville-Mapleton division	8,637	7,812	7,997	534,910	66.89								
Total, Strawberry Valley project	40,178	36,442	37,574	2,383,844	63.44								
Weber River									109,016	90,941	91,016	11,215,871	123.23
Total, region 4	236,411	188,209	187,057	15,760,238	84.25	3,230	117,813	36.47	424,932	342,361	347,158	28,401,398	81.81

REGION 5													
Oklahoma													
W. C. Austin	47,810	42,994	43,735	5,414,603	123.80								
New Mexico													
Carlsbad	25,055	24,338	24,338	4,651,561	191.12								
Fort Sumner [3]	6,500	5,065	5,065	608,703	120.18								
Tucumcari	42,214	32,797	33,755	2,323,101	68.82								
New Mexico-Texas													
Rio Grande:													
Elephant Butte Irrigation District (New Mexico)	88,000	92,109	85,242	30,939,961	362.97	6,897	1,661,685	240.93					
El Paso County Water Improvement District No. 1 (Texas)	67,000	66,365	62,790	25,435,715	405.09	3,583	1,036,851	289.38					
Total, Rio Grande project	[9] 155,000	158,474	148,032	56,375,676	380.83	10,480	2,698,536	257.49					
Texas													
Balmorhea [4]									10,530	7,151	8,535	1,006,067	117.88
Total, region 5	276,579	263,668	254,925	69,373,644	272.13	10,480	2,698,536	257.49	10,530	7,151	8,535	1,006,067	117.88
REGION 6													
Montana													
Buffalo Rapids:													
1st division [4]	13,903	13,227	13,445	762,215	56.69								
2d division [4]	8,792	8,293	8,530	508,253	59.58								
Total, Buffalo Rapids project	22,695	21,520	21,975	1,270.468	57.81								
Huntley	32,508	24.470	17,185	1,341,220	78.05	7,396	361,257	48.84					
Intake [4]	881	523	523	22.068	42.20								
Milk River:													
Chinook division	43,484	25,418	26,228	1,821,860	69.46								
Dodson Pumping unit [4]	1,180	999	1,036	53,556	51.69								
Glasgow division	19,407	10,929	9,761	432,271	44.29	1,407	53,554	38.06					
Malta division	53,733	25,298	17,172	933,129	54.34	8,390	253,236	30.18					
Pump lands	6,671	6,541	6,671	425,205	63.74								
Total, Milk River project	124,475	69,185	60,868	3,666,021	60.23	9,797	306,790	31.31					
Missouri River Basin: Yellowstone division (Savage unit)	2,216	2,015	2,015	78,791	39.10								
Sun River:													
Fort Shaw division	13,538	7,484	7,436	273,255	36.75	161	2,785	17.30					
Greenfields division	74,029	62,095	66,957	2,856,926	42.67								
Total, Sun River project	87,567	69,579	74,393	3,130,181	42.08	161	2,785	17.30					

See footnotes at end of table, p. 162.

TABLE 5.—Projects in operation—Irrigation and crop value data for the calendar year 1952—Continued

State, project, and subdivision	Full supply projects constructed or rehabilitated by the Bureau								Supplemental supply projects constructed or rehabilitated by the Bureau				
	Irrigable area for service [1]	Irrigated area	Land subject to construction charges			Temporarily suspended land [2]			Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
			Net area in cultivation	Gross crop value		Net area in cultivation	Gross crop value	Value per acre				Total	Per acre
				Total	Per acre								
REGION 6—Continued													
Montana-North Dakota													
Lower Yellowstone:	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*
District No. 1 (Montana)	37,272	31,759	32,793	2,122,412	64.72	241	11,617	48.20					
District No. 2 (North Dakota)	19,928	16,203	16,446	967,475	58.83	220	10,604	48.20					
Total, Lower Yellowstone project	57,200	47,962	49,239	3,089,887	62.75	461	22,221	48.20					
North Dakota													
Buford-Trenton [4]	9,623	9,060	9,499	477,008	50.22								
South Dakota													
Belle Fourche	59,129	52,991	53,370	2,451,360	45.93	102	1,375	13.48					
Rapid Valley [4]									8,900	7,470	7,470	257,356	34.45
Wyoming													
Riverton:													
Midvale Irrigation District	46,146	41,333	34,497	1,807,388	52.39	7,030	319,335	45.42					
3d division	12,297	10,841	11,085	354,627	31.99								
Total, Riverton project	58,443	52,174	45,582	2,162,015	47.43	7,030	319,335	45.42					
Wyoming-Montana													
Shoshone:													
Frannie division	20,083	10,712	9,939	462,164	46.50	773	21,444	27.74					
Garland division	41,627	34,155	33,542	2,086,067	62.19	613	17,059	27.83					
Heart Mountain division	25,182	21,877	22,090	1,408,836	63.78								
Willwood division	11,426	10,051	10,275	646,241	62.89								
Total, Shoshone project	98,318	76,795	75,846	4,603,308	60.69	1,386	38,503	27.78					
Total, region 6	553,055	426,274	410,495	22,292,327	54.31	26,333	1,052,266	39.96	8,900	7,470	7,470	257,356	34.45

REGION 7													
Colorado													
Colorado-Big Thompson									615,000	615,000	615,000	72,366,992	117.67
Nebraska													
Mirage Flats [4]	11,657	11,239	11,282	1,167,623	103.49								
Missouri River Basin:													
Bostwick division (Superior-Courtland unit)	10,360	2,238	2,238	209,539	93.63								
Frenchman-Cambridge division	4,665	4,625	4,665	448,785	96.20								
Nebraska-Wyoming													
North Platte:													
Gering-Ft. Laramie Irrigation District	54,845	52,871	53,322	5,872,673	110.14								
Goshen Irrigation District (Wyoming)	52,484	50,033	50,033	4,427,595	88.49								
Northport Irrigation District	13,615	12,911	12,911	870,575	67.43								
Pathfinder Irrigation District	[10] 102,824	88,086	88,086	6,836,686	77.61								
Total, North Platte project	223,768	203,901	204,352	18,007,529	88.12								
Wyoming													
Kendrick	16,162	11,407	11,407	433,327	37.99								
Total, region 7	266,612	233,410	233,944	20,266,803	86.63				615,000	615,000	615,000	72,366,992	117.67

See footnotes at end of table, p. 162.

TABLE 5.—Projects in operation—Irrigation and crop value data for the calendar year 1952—Continued

State, project, and subdivision	Special and Warren Act contractors receiving water from Bureau-constructed works					Leased and water rental lands receiving water from Bureau-constructed works					Entire area receiving full or supplemental water from Bureau-constructed works				
	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
				Total	Per acre				Total	Per acre				Total	Per acre
REGION 1															
Idaho	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*
Lewiston Orchards [3]											3, 523	2, 545	2, 576	518, 349	201. 22
Minidoka:															
American Falls Reservoir District No. 2											98, 434	83, 042	85, 042	6, 483. 395	76. 24
Burley Irrigation District											47, 937	44, 376	44, 376	5, 132, 326	115. 66
Fremont-Madison Irrigation District											112, 000	100, 505	100, 505	12, 492, 488	124. 30
Minidoka Irrigation District											71, 882	63, 370	63, 370	6, 688, 261	105. 54
North Side pumping division						5, 999	5, 708	5, 708	1, 240, 907	217. 40	5, 999	5, 708	5, 708	1, 240, 907	217. 40
Special and Warren Act contractors	746, 240	705, 434	705, 434	83, 068, 700	117. 76						746, 240	705, 434	705, 434	83, 068, 700	117. 76
Total, Minidoka project	746, 240	705, 434	705, 434	83, 068, 700	117. 76	5, 999	5, 708	5, 708	1, 240, 907	217. 40	1, 082, 492	1, 002, 435	1, 004, 435	115, 106, 077	114. 60
Rathdrum Prairie:															
Hayden Lake unit [3]											1, 087	567	574	54, 010	94. 09
Post Falls unit [3] [4]											3, 109	2, 571	2, 650	219, 983	83. 01
Total, Rathdrum Prairie project											4, 196	3, 138	3, 224	273, 993	84. 99
Idaho-Oregon															
Boise:															
Big Bend Irrigation District (Oregon)											1, 724	1, 462	1, 462	106, 136	72. 60
Black Canyon Irrigation District, unit 1											6, 880	6, 502	6, 599	936, 143	141. 86
Black Canyon Irrigation District, unit 2											51, 760	43, 165	43, 203	2, 844, 631	65. 84

District											48, 660	45, 145	45, 332	4, 100, 429	90. 45
Nampa and Meridian Irrigation District											40, 196	34, 495	34, 566	3, 152, 916	91. 21
New York Irrigation District											17, 826	14, 279	14, 390	762, 238	52. 97
Settlers Irrigation District											518				
Wilder Irrigation District											56, 554	50, 324	50, 414	7, 644, 931	151. 64
Special and Warren Act contractors	132, 197	122, 900	123, 400	13, 387, 998	108. 49						132, 197	122, 900	123, 400	13, 387, 998	108. 49
Total, Boise project	132, 197	122, 900	123, 400	13, 387, 998	108. 49						356, 315	318, 272	319, 366	32, 935, 422	103. 13
Montana															
Bitter Root [3]											16, 665	16, 226	16, 482	655, 250	39. 76
Frenchtown											4, 810	2, 826	3, 093	181, 871	58. 80
Missoula Valley [4]											977	562	601	15, 336	25. 52
Oregon															
Arnold [3]											4, 343	2, 712	2, 712	217, 824	80. 32
Baker											7, 312	7, 305	7, 305	275, 380	37. 70
Burnt River											15, 291	15, 240	15, 240	590, 560	38. 75
Deschutes:															
Central Oregon Irrigation District [3]											46, 739	40, 830	41, 967	5, 406, 265	128. 82
Lone Pine Irrigation District	2, 520	2, 460									2, 520	2, 460			
North unit						0	583	583	74, 273	127. 40	50, 000	48, 434	48, 434	8, 117, 836	167. 61
Total, Deschutes project	2, 520	2, 460				0	583	583	74, 273	127. 40	99, 259	91, 724	90, 401	13, 524, 101	149. 60
Grants Pass [3]											10, 337	6, 718	7, 241	854, 156	117. 96
Ochoco [3]											8, 500	7, 985	7, 985	1, 509, 671	189. 06
Umatilla:															
East division											10, 911	5, 931	5, 931	296, 568	50. 00
West division						530	463	478	99, 086	207. 29	7, 776	5, 544	5, 878	376, 647	64. 08
South division:															
Stanfield Irrigation District [3]											6, 000	5, 095	5, 340	578, 142	108. 27
Westland Irrigation District											8, 270	5, 353	5, 513	343, 874	62. 38
Total, Umatilla project						530	463	478	99, 086	207. 29	32, 957	21, 923	22, 662	1, 595, 231	70. 39
Vale											32, 000	31, 630	31, 630	2, 450, 555	77. 48

See footnotes at end of table, p. 162.

TABLE 5.—Projects in operation—Irrigation and crop value data for the calendar year 1952—Continued

State, project, and subdivision	Special and Warren Act contractors receiving water from Bureau-constructed works					Leased and water rental lands receiving water from Bureau-constructed works					Entire area receiving full or supplemental water from Bureau-constructed works				
	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
				Total	Per acre				Total	Per acre				Total	Per acre
REGION 1—continued															
Oregon-Idaho															
Owyhee:	Acres	Acres	Acres	Dollars	Dollars	Acres	Acres	Acres	Dollars	Dollars	Acres	Acres	Acres	Dollars	Dollars
Advancement Irrigation District											700	606	606	163,827	270.34
Bench Irrigation District											2,319	2,243	2,243	652,955	291.11
Crystal Irrigation District											1,280	1,202	1,202	402,846	335.15
Gem Irrigation District (Idaho)											33,454	31,963	32,383	4,008,542	123.79
Ontario-Nyssa Irrigation District											5,831	5,790	5,790	1,564,700	270.24
Owyhee Irrigation District											49,583	45,994	45,994	5,623,946	122.28
Payette-Oregon Slope Irrigation District											4,699	4,349	4,349	1,300,166	298.96
Ridgeview Irrigation District											6,159	5,904	6,009	732,163	121.84
Slide Irrigation District											1,144	1,094	1,094	232,966	212.95
Special and Warren Act contractors	13,800	13,110	13,110	5,150,369	392.86						13,800	13,110	13,110	5,150,369	392.86
Total, Owyhee project	13,800	13,110	13,110	5,150,369	392.86						118,969	112,255	112,780	19,832,480	175.85
Washington															
Columbia Basin:															
East Columbia Basin Irrigation District											26,444	8,828	8,960	2,774,865	309.69
Quincy-Columbia Basin Irrigation District											39,609	12,486	12,489	993,380	79.54

South Columbia Basin Irrigation District											6,644	5,813	5,612	918,640	163.69
Total, Columbia Basin project											72,697	27,127	27,061	4,686,885	173.20
Okanogan											5,347	3,611	3,938	1,602,578	406.95
Yakima:															
Kittitas division											59,610	54,093	54,458	3,789,491	69.59
Roza division											72,185	63,508	63,508	14,570,441	229.43
Sunnyside division						270	258	260	45,167	173.72	103,579	79,338	80,090	14,401,367	179.81
Tieton division											27,271	24,426	24,623	10,435,296	423.80
Special and Warren Act contractors	190,041	162,929	163,017	30,294,446	185.84						190,041	162,929	163,017	30,294,446	185.84
Total, Yakima project	190,041	162,929	163,017	30,294,446	185.84	270	258	260	45,167	173.72	452,686	384,294	385,696	73,491,041	190.54
Total, region 1	1,084,798	1,006,833	1,004,961	131,901,513	131.25	6,799	7,012	7,029	1,459,433	207.63	2,328,676	2,058,528	2,064,428	270,316,760	130.94
REGION 2															
California															
Central Valley [5]	786,845	568,290	587,915	152,208,532	258.90						786,845	568,290	587,915	152,208,532	258.90
Orland											19,466	17,200	17,200	1,837,022	106.80
Oregon-California															
Klamath:															
Main division (Oregon)											[6] 40,225	34,616	34,864	5,008,791	143.67
Tule Lake division (California)											[7] 44,423	42,753	43,000	11,589,267	269.52
Leased and water rental lands						70,050	31,047	31,047	4,897,095	157.73	70,050	31,047	31,047	4,897,095	157.73
Special and Warren Act contractors	89,703	80,719	80,719	9,409,651	116.57						89,703	80,719	80,719	9,409,651	116.57
Total, Klamath project	89,703	80,719	80,719	9,409,651	116.57	70,050	31,047	31,047	4,897,095	157.73	244,401	189,135	189,630	30,904,804	162.97
Total, region 2	876,548	649,009	668,634	161,618,183	241.71	70,050	31,047	31,047	4,897,095	157.73	1,050,712	774,625	794,745	184,950,358	232.72

See footnotes at end of table, p. 162.

TABLE 5.—Projects in operation—Irrigation and crop value data for the calendar year 1952—Continued

State, project, and subdivision	Special and Warren Act contractors receiving water from Bureau-constructed works					Leased and water rental lands receiving water from Bureau-constructed works					Entire area receiving full or supplemental water from Bureau-constructed works				
	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
				Total	Per acre				Total	Per acre				Total	Per acre
REGION 3															
Arizona															
Gila:	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*
Wellton-Mohawk division											14, 212	14, 134	14, 212	3, 118, 404	219. 42
Yuma Mesa division:															
North Gila unit	764	764	764	116, 667	152. 71						8, 051	7, 061	7, 096	1, 735, 585	244. 59
South Gila unit	846	846	846	200, 365	236. 84						846	846	846	200, 365	236. 84
Yuma Mesa unit											20, 251	10, 506	10, 419	1, 362, 711	130. 79
Total, Gila project	1, 610	1, 610	1, 610	317, 032	196. 91						43, 360	32, 547	32, 573	6, 417, 065	197. 01
Salt River	95, 724	79, 881	79, 881	23, 470, 331	293. 82						336, 150	298, 276	305, 657	84, 161, 154	275. 35
Yuma auxiliary											3, 393	2, 263	2, 263	1, 044, 222	461. 43
Arizona-California															
Yuma:															
Reservation division:															
Indian lands (California)											7, 743	5, 565	5, 572	1, 336, 743	248. 88
Bard unit (California)											7, 110	6, 219	6, 325	1, 288, 084	203. 65
Valley division (Arizona)											51, 510	47, 333	47, 473	16, 413, 962	345. 75
Total, Yuma project											66, 363	59, 117	59, 370	19, 088, 789	321. 52
California															
Boulder Canyon: All-American Canal system:															
Coachella division											60, 715	36, 531	36, 989	19, 213, 773	519. 45
Imperial division [8]	517, 000	425, 000	440, 000	93, 394, 738	212. 26						517, 000	425, 000	440, 000	93, 394, 738	212. 26
Total, Boulder Canyon project	517, 000	425, 000	440, 000	93, 394, 738	212. 26						577, 715	461, 531	476, 989	112, 608, 511	236. 08
Total, region 3	614, 334	506, 491	521, 491	117, 182, 101	224. 71						1, 026, 981	853, 734	876, 852	223, 319, 741	254. 68

REGION 4															
Colorado															
Fruitgrowers Dam [3]											2, 662	2, 060	2, 060	350, 633	170. 21
Grand Valley:															
Garfield gravity division						1, 367	75	75	8, 174	108. 99	31, 811	21, 618	21, 618	1, 974, 740	91. 35
Orchard Mesa division [3]											10, 027	8, 776	8, 776	2, 114, 217	240. 91
Special and Warren Act contractors	8, 045	7, 690	7, 690	1, 436, 690	186. 83						8, 045	7, 690	7, 690	1, 436, 690	186. 83
Total, Grand Valley project	8, 045	7, 690	7, 690	1, 436, 690	186. 83	1, 367	75	75	8, 174	108. 99	49, 883	38, 084	38, 084	5, 525, 647	145. 09
Mancos [4]											8, 612	7, 688	7, 688	283, 434	36. 87
Paonia [3]											11, 500	10, 700	10, 800	1, 006, 435	93. 19
Pine River											35, 766	32, 620	33, 300	1, 032, 058	30. 99
Pine River Indian Irrigation											9, 660	9, 321	9, 660	240, 881	24. 94
Uncompahgre	13, 226	13, 059	13, 096	568, 887	43. 44						85, 823	70, 349	71, 232	5, 557, 325	78. 02
Idaho															
Preston Bench [3]											6, 707	4, 540	4, 704	388, 319	82. 55
Nevada															
Humboldt											40, 012	25, 355	25, 365	2, 532, 708	99. 85
Newlands:															
North Carson division											6, 799	4, 181	4, 181	294, 874	70. 53
South Carson division											57, 331	43, 825	43, 825	2, 755, 704	62. 83
Truckee division											7, 535	5, 452	5, 452	367, 973	67. 49
Total, Newlands project											71, 665	53, 458	53, 458	3, 418, 551	63. 95
Truckee Storage											29, 370	22, 990	22, 990	2, 344, 675	101. 99
Utah															
Hyrum											6, 606	5, 686	5, 719	370, 128	64. 72
Moon Lake											75, 256	58, 303	58, 796	1, 492, 166	25. 38
Newton [4]											2, 534	1, 738	1, 893	130, 133	68. 74
Ogden River											22, 860	16, 123	16, 132	1, 778, 315	110. 24
Provo River: Deer Creek division											46, 609	39, 384	40, 056	4, 602, 531	114. 90
Sanpete:															
Ephraim division											7, 630	6, 733	7, 133	272, 249	38. 17
Spring City division											6, 023	5, 020	5, 778	197, 025	34. 10
Total, Sanpete project											13, 653	11, 753	12, 911	469, 274	36. 35
Scofield [4]											15, 609	13, 859	14, 868	1, 170, 272	78. 71

See footnotes at end of table, p. 162.

TABLE 5.—Projects in operation—Irrigation and crop value data for the calendar year 1952—Continued

State, project, and subdivision	Special and Warren Act contractors receiving water from Bureau-constructed works					Leased and water rental lands receiving water from Bureau-constructed works					Entire area receiving full or supplemental water from Bureau-constructed works				
	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
				Total	Per acre				Total	Per acre				Total	Per acre
REGION 4—continued															
Utah—Continued															
Strawberry Valley:	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*
High Line division											17, 695	15, 565	16, 073	869, 620	54. 10
Spanish Fork division	3, 676	3, 448	3, 590	256, 568	71. 47						17, 522	16, 513	17, 094	1, 235, 882	72. 30
Springville-Mapleton division											8, 637	7, 812	7, 997	534, 910	66. 89
Total, Strawberry Valley project	3, 676	3, 448	3, 590	256, 568	71. 47						43, 854	39, 890	41, 164	2, 640, 412	64. 14
Weber River											109, 016	90, 941	91, 016	11, 215, 871	123. 23
Total, region 4	24, 947	24, 197	24, 376	2, 262, 145	92. 80	1, 367	75	75	8, 174	108. 99	687, 657	554, 842	561, 896	46, 549, 768	82. 84
REGION 5															
Oklahoma															
W. C. Austin											47, 810	42, 994	43, 735	5, 414, 603	123. 80
New Mexico															
Carlsbad											25, 055	24, 338	24, 338	4, 651, 561	191. 12
Fort Sumner [3]											6, 500	5, 065	5, 065	608, 703	120. 18
Tucumcari											42, 214	32, 797	33, 755	2, 323, 101	68. 82
New Mexico-Texas															
Rio Grande:															
Elephant Butte Irrigation District (New Mexico)											88, 000	92, 109	92, 139	32, 601, 646	353. 83
El Paso County Water Improvement District No. 1 (Texas)						138	138	138	29, 872	216. 46	67, 138	66, 503	66, 511	26, 502, 438	398. 47
Hudspeth County Conservation and Reclamation District No. 1 (Texas)	18, 318	17, 318	17, 318	4, 181, 811	241. 47						18, 318	17, 318	17, 318	4, 181, 811	241. 47
Total, Rio Grande project	18, 318	17, 318	17, 318	4, 181, 811	241. 47	138	138	138	29, 872	216. 46	[9] 173, 456	175, 930	175, 968	63, 285, 895	359. 64

Texas															
Balmorhea [4]											10, 530	7, 151	8, 535	1, 006, 067	117. 88
Total, region 5	18, 318	17, 318	17, 318	4, 181, 811	241. 47	138	138	138	29, 872	216. 46	305, 565	288, 275	291, 396	77, 289, 930	265. 24
REGION 6															
Montana															
Buffalo Rapids:															
1st division [4]						1, 218	1, 186	1, 206	39, 654	32. 88	15, 121	14, 413	14, 651	801, 869	54. 73
2d division [4]						798	765	787	27, 298	34. 69	9, 590	9, 058	9, 317	535, 551	57. 48
Total, Buffalo Rapids project						2, 016	1, 951	1, 993	66, 952	33. 59	24, 711	23, 471	23, 968	1, 337, 420	55. 80
Huntley						729	727	729	63, 936	87. 70	33, 237	25, 197	25, 310	1, 766, 413	69. 79
Intake [4]											881	523	523	22, 068	42. 20
Milk River:															
Chinook division											43, 484	25, 418	26, 228	1, 821, 860	69. 46
Dodson pumping unit [4]											1, 180	999	1, 036	53, 556	51. 69
Glasgow division											19, 407	10, 929	11, 168	485, 825	43. 50
Malta division											53, 733	25, 298	25, 562	1, 186, 365	46. 41
Pump lands											6, 671	6, 541	6, 671	425, 205	63. 74
Total, Milk River project											124, 475	69, 185	70, 665	3, 972, 811	56. 22
Missouri River Basin: Yellowstone division (Savage unit)											2, 216	2, 015	2, 015	78, 791	39. 10
Sun River:															
Fort Shaw division											13, 538	7, 484	7, 597	276, 040	36. 34
Greenfields division						490	411	490	11, 429	23. 32	74, 519	62, 506	67, 447	2, 868, 355	42. 53
Total, Sun River project						490	411	490	11, 429	23. 32	88, 057	69, 990	75, 044	3, 144, 395	41. 90
Montana–North Dakota															
Lower Yellowstone:															
District No. 1 (Montana)											37, 272	31, 759	33, 034	2, 134, 029	64. 60
District No. 2 (North Dakota)											19, 928	16, 203	16, 666	978, 079	58. 69
Leased and water rental lands						748	625	625	30, 528	48. 84	748	625	625	30, 528	48. 84
Total, Lower Yellowstone project						748	625	625	30, 528	48. 84	57, 948	48, 587	50, 325	3, 142, 636	62. 45

See footnotes at end of table, p. 162.

TABLE 5.—Projects in operation—Irrigation and crop value data for the calendar year 1952—Continued

State, project, and subdivision	Special and Warren Act contractors receiving water from Bureau-constructed works					Leased and water rental lands receiving water from Bureau-constructed works					Entire area receiving full or supplemental water from Bureau-constructed works				
	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value: Total	Gross crop value: Per acre	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value: Total	Gross crop value: Per acre	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value: Total	Gross crop value: Per acre
REGION 6—continued															
North Dakota	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*	*Acres*	*Acres*	*Acres*	*Dollars*	*Dollars*
Buford-Trenton [4]											9, 623	9, 060	9, 499	477, 008	50. 22
Missouri River Basin: Heart division (Heart Butte unit)						174	174	174	16, 411	94. 32	174	174	174	16, 411	94. 32
South Dakota															
Belle Fourche						253	253	253	6, 390	25. 26	59, 382	53, 244	53, 725	2, 459, 125	45. 77
Rapid Valley [4]											8, 900	7, 470	7, 470	257, 356	34. 45
Wyoming															
Riverton:															
Midvale Irrigation District	1, 898	1, 778	1, 778	95, 043	53. 46						48, 044	43, 111	43, 305	2, 221, 766	51. 31
3d division	14	14	14	437	31. 21	782	782	782	21, 268	27. 20	13, 093	11, 637	11, 881	376, 332	31. 68
Total, Riverton project	1, 912	1, 792	1, 792	95, 480	53. 28	782	782	782	21, 268	27. 20	61, 137	54, 748	55, 186	2, 598, 098	47. 08
Wyoming-Montana															
Shoshone:															
Frannie division											20, 083	10, 712	10, 712	483, 608	45. 15
Garland division											41, 627	34, 155	34, 155	2, 103, 126	61. 58
Heart Mountain division						1, 032	660	740	34, 598	46. 75	26, 214	22, 537	22, 830	1, 443, 434	63. 23
Willwood division											11, 426	10, 051	10, 275	646, 241	62. 89
Total, Shoshone project						1, 032	660	740	34, 598	46. 75	99, 350	77, 455	77, 972	4, 676, 409	59. 98
Total, region 6	1, 912	1, 792	1, 792	95, 480	53. 28	6, 224	5, 583	5, 786	251, 512	43. 47	570, 091	441, 119	451, 876	23, 948, 941	53. 00

REGION 7														
Colorado														
Colorado-Big Thompson	------	------	------	------	------	------	------	------	------	------	615,000	615,000	615,000	72,366,992	117.67
Nebraska															
Mirage Flats [4]	------	------	------	------	------	------	------	------	------	------	11,657	11,239	11,282	1,167,623	103.49
Missouri River Basin:															
Bostwick division (Superior-Courtland unit)	------	------	------	------	------	------	------	------	------	------	10,360	2,238	2,238	209,539	93.63
Frenchman-Cambridge Division	------	------	------	------	------	------	------	------	------	------	4,665	4,625	4,665	448,785	96.20
Nebraska–Wyoming															
North Platte:															
Gering-Fort Laramie Irrigation District	------	------	------	------	------	------	------	------	------	------	54,845	52,871	53,322	5,872,673	110.14
Goshen Irrigation District (Wyoming)	------	------	------	------	------	------	------	------	------	------	52,484	50,033	50,033	4,427,595	88.49
Northport Irrigation District	------	------	------	------	------	------	------	------	------	------	13,615	12,911	12,911	870,575	67.43
Pathfinder Irrigation District	------	------	------	------	------	------	------	------	------	------	[10] 102,824	88,086	88,086	6,836,686	77.61
Leased and water rental lands	------	------	------	------	------	[11] 34,469	29,651	29,651	2,776,536	93.64	[11] 34,469	29,651	29,651	2,776,536	93.64
Special and Warren Act contractors	[12] 108,715	106,566	106,566	13,893,926	130.38	------	------	------	------	------	[12] 108,715	106,566	106,566	13,893,926	130.38
Total, North Platte project	108,715	106,566	106,566	13,893,926	130.38	34,469	29,651	29,651	2,776,536	93.64	366,952	340,118	340,569	34,677,991	101.82
Wyoming															
Kendrick	------	------	------	------	------	------	------	------	------	------	16,162	11,407	11,407	433,327	37.99
Total, region 7	108,715	106,566	106,566	13,893,926	130.38	34,469	29,651	29,651	2,776,536	93.64	1,024,796	984,627	985,161	109,304,257	110.95

See footnotes at end of table, p. 162.

TABLE 5.—Projects in operation—Irrigation and crop value data for the calendar year 1952—Continued

Summary

	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	Value per acre
	Acres	*Acres*	*Acres*	*Dollars*	*Dollars*
Full supply projects	2,890,885	2,423,728	2,409,636	369,368,296	153.29
Supplemental supply projects	1,254,974	1,146,310	1,154,033	121,718,522	105.47
Special and Warren Act contractors	2,729,572	2,312,206	2,345,138	431,135,159	183.84
Additional areas reported:					
Temporarily suspended land			43,821	4,035,156	92.08
Leased and water rental lands	119,047	73,506	73,726	9,422,622	127.81
Grand total	6,994,478	5,955,750	6,026,354	935,679,755	155.26
Grand total, 1951	6,713,015	5,875,769	5,942,013	821,721,665	138.29
Increase, 1951–52 total	281,463	79,981	84,341	113,958,090	16.97

NOTE.—Per acre value based on net area in cultivation.

[1] Area for which the Bureau is prepared to supply water.

[2] Generally part of irrigable area for service but not subject to construction charges until reclaimed.

[3] Private project reconstructed with Government funds.

[4] Water conservation and utilization project.

[5] Special contract.

[6] Of this irrigable area for service, 929 acres are in California and 39,296 acres are in Oregon.

[7] Of this irrigable area for service, 42,334 acres are in California and 2,089 acres are in Oregon.

[8] Special contract. Bureau constructed diversion dam and canal carriage system. Distribution system and power plants on the All-American Canal were built by Imperial Irrigation District. Prior to construction of All-American Canal, district lands were irrigated with Colorado River water from a district-constructed system.

[9] Although there are 178,026 acres that can be irrigated within project limits, the area for which there is considered to be a safe and reliable water supply is 155,000 acres; 88,000 in the Elephant Butte District and 67,000 in the El Paso District.

[10] Of this irrigable area for service, 100,949 acres are in Nebraska and 1,875 acres are in Wyoming.

[11] Of this irrigable area for service, 24,602 acres are in Nebraska and 9,867 acres are in Wyoming.

[12] Of this irrigable area for service, 92,398 acres are in Nebraska and 16,317 acres are in Wyoming.

TABLE 6.—Cumulative crop values—1906–52

Year	Federal irrigation projects [1]					Warren Act lands and special contractors					Entire area				
	Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value		Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value		Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value	
				For year	Cumulative total				For year	Cumulative total				For year	Cumulative total
1906	39,300	[2] 22,300	[2] 20,100	[2] $244,900							39,300	[2] 22,300	[2] 20,100	[2] $244,900	
1907	266,300	[2] 187,628	[2] 169,000	[2] 4,760,460	$5,005,360						266,300	[2] 187,628	[2] 169,000	[2] 4,760,460	$5,005,360
1908	488,942	[2] 289,549	[2] 260,500	[2] 7,635,888	12,641,248						488,942	[2] 289,549	[2] 260,500	[2] 7,635,888	12,641,248

1909	730,601	410,628	410,628	11,920,663	24,561,911	----------	----------	----------	----------	----------	730.601	410,628	369,500	11,920,663	24,561,911
1910	917,751	473,423	473,423	12,974,639	37,536,550	----------	----------	----------	----------	----------	917,751	473.423	413,000	12,974,639	37,536,550
1911	1,042,609	564,681	564,681	13.121,224	50,657,774	----------	----------	----------	----------	----------	1,042.609	564,681	470,100	13,121,224	50,657,774
1912	1,205,236	618,680	641,397	14,479,368	65,137,142	----------	----------	----------	----------	----------	1,205,236	618,680	540,000	14.479,368	65,137.142
1913	1,255,381	699,183	642,216	15,732,215	80.869,357	----------	----------	----------	----------	----------	1,255,381	699,183	637,227	15,732,215	80,869,357
1914	1,240,875	761,271	703,424	16.475,517	97,344,874	----------	----------	----------	----------	----------	1,240,875	761,271	703,424	16,475,517	97,344.874
1915	1,472.772	856,778	757,613	18,164,452	115,509,326	----------	----------	----------	----------	----------	1,472.772	856,778	760,035	18,164,452	115,509,326
1916	1,405,452	922,821	858,291	32.815,972	148,325,298	----------	----------	----------	----------	----------	1,405,452	922,821	858,291	32,815,972	148,325,298
1917	1,599,525	1,057,513	966,784	56,462,313	204,787,611	----------	----------	----------	----------	----------	1,599,525	1,057,513	966,784	56,462,313	204,787,611
1918	1,732,374	1,141,516	1,051,193	66,821,396	271,609,007	951,987	[2] 501,100	[2] 481,600	[2] $35,000,000	----------	2,684,361	[2] 1,642,616	[2] 1,532,793	[2] 101,821,396	306,609,007
1919	1,636,159	1,187,255	1,113,469	88,974,137	360,583,144	1,011.815	916,313	880,613	64,004,750	$99,004,750	2,647,974	2,103,568	1,994,082	152,978,887	459,587,894
1920	1,661,960	1,223,480	1,153,820	66,171,650	426,754,794	1,183,292	981,940	950,890	47,505,770	146,510,520	2,845,252	2,205,420	2,104,710	113,677,420	573,265,314
1921	1,674,100	1,227,500	1,157,900	49,620,300	476,375,094	1,146,810	1,001,250	969,550	44,906,130	191,416,650	2.820,910	2,228.750	2,127,450	94,526,430	667,791,744
1922	1,692,700	1,202,130	1,169,100	50,360,850	526,735,944	1,101,700	983,290	951,270	33,240,840	224,657,490	2,794,400	2,185,420	2,120,370	83,601,690	751,393,434
1923	1,718,400	1,213,700	1,179,870	65,046,300	591,782,244	1,231,400	1,051,380	993,040	37,557,860	262,215,350	2,949,800	2,265,080	2,172,910	102,604,160	853,997,594
1924	1,805,730	1,290,890	1,216,610	66,488,560	658,270,804	1,237,885	930,670	889,460	43,237,470	305,452,820	3,043,615	2,221,560	2,106,070	109,726,030	963,723,624
1925	1,802,970	1,320,300	1,242,750	77,608,880	735,879,684	1,340,000	1,019,170	951,250	53,655,850	359,108,670	3,142,970	2,339,470	2,194,000	131,264,730	1,094,988,354
1926	1,844,550	1,411,020	1,361,470	60,664,900	796,544,584	1,329,020	1,097,190	949,590	49,750,040	408,858,710	3,173,570	2,508,210	2,278,400	110,414,940	1,205,403,294
1927	1,956,910	1,378,990	1,431,560	72,047,200	868,591,784	1,482,950	1,148,115	1,072,486	61,160,010	470,018,720	3,439,860	2,527,105	2,399,296	133,207,210	1,338,610.504
1928	1,882,930	1,442,080	1,489,240	81,077,750	949,669,534	1,490,735	1,235,020	1,192,030	62,495,320	532.514,040	3,373,665	2,677,100	2.577,590	143,573,070	1,482,183,574
1929	1,922,330	1,483,900	1,512,250	88,459,390	1,038,128,924	1,480,040	1,234,230	1,192,990	72,720,490	605,234,530	3,402,370	2,718.130	2,613,060	161,179,880	1,643,363,454
1930	1,993,390	1,504,810	1.550,967	65,007,270	1,103.136,194	1,640,722	1,286,046	1,254,493	54,654,550	659.889,080	3,634,112	2,790,856	2.721,590	119,661,820	1,763,025,274
1931	2,027,264	1,552,718	1,520,354	40,554.037	1,143,690,231	1,588,972	1,293,889	1,251,830	33,406,340	693,295,420	3,616,236	2,846,607	2,714,395	73,960,377	1,836,985.651
1932	2,039,074	1,555,144	1,578.880	31.531.162	1,175,221.393	1.512,405	1,214,461	1,196,400	18,627,219	711,922,639	3.551,479	2.769,605	2,702,720	50,158,381	1,887,144,032
1933	2,025,508	1,589,770	1,598.702	48.765,863	1,223,987,256	1,514,201	1,239,017	1,199,113	35,425,870	747,348,509	3,539,709	2,828,787	2,797,815	84.191,733	1,971,335,765
1934	1.986,268	1,552,124	1,527,104	60,928,969	1,284,916,225	1,508,377	1.285,081	1,229,594	40,014,745	787,363,254	3,494,645	2.837,205	2,693,999	100 943,714	2,072,279,479
1935	2,113,506	1,640,936	1,604,166	63,601,663	1,348.517,888	1,500,589	1,294,680	1.256.970	43,179,631	830,542,885	3,614,095	2,935,616	2.861,136	106,781,294	2,179,060,773
1936	2,166,409	1,702,192	1,629,174	78,902,818	1,427,420,706	1,527,008	1,335,995	1,272.745	57,599,662	888,142,547	3,693,417	3.038,187	2,901,919	136,502.480	2,315,563,253
1937	2,194.830	1.725,463	1,700,969	72,893,649	1,500.314.355	1,571,382	1,389,338	1,333,800	45,764,623	933,907,170	3,766,212	3,114.801	3,034.769	118,658,272	2,434,221,525
1938	2,275,882	1,777,584	1,764,363	67,859,804	1,568,174,159	1,507,051	1,329,115	1,276.332	45,603,656	979,510,826	3,782,933	3,106,699	3.040,695	113,463,460	2,547,684,985
1939	2,492.740	1,922,868	1,903,269	73,769,654	1.641.943.813	1.396,800	1,218.108	1,174,803	40,313,140	1 019.823,966	3,889.540	3,140.976	3.078,072	114.082.794	2,661,767,779
1940	2,780,811	2,152,808	2,138,927	80.098,196	1,722,042,009	1,399.057	1,238,262	1,177,103	37,690,481	1,057,514,447	4.179,868	3,391,070	3,316,030	117,788,677	2,779,556,456
1941	3.547,816	2,199,179	2,178.288	110,399,807	1,832,441,816	1.398,338	1,249,204	1,202,172	49,486,191	1,107,000,638	4,946,154	3,448,383	3,380,460	159.885,998	2,939,442,454
1942	3,487,944	2,688,723	2,615,048	193,783,707	2,026,225.523	1.360,757	1,247,512	1,206.651	78,264,809	1,185,265,447	4,848,701	3,936,235	3,821,699	272,048,516	3,211,490,970
1943	2,957,806	2,422,288	2,398,922	218,064,208	2,244,289,731	1,896,026	1,633.041	1,615,424	170,606,761	1,355,872,208	4,853,832	4,055.329	4,014,346	388,670,969	3,600,161,939
1944	2,970,714	2,468,842	2 475,280	224.683,280	2,468,973,011	1,969,281	1,694,861	1,664,069	186,543,084	1,542,415,292	4,939,995	4,163,703	4,139,349	411.226.364	4,011,388,303
1945	2,975,590	2,416,961	2.464,672	232,545,321	2,701,518,332	2,054.746	1,745,627	1,731,060	202,639,074	1,745,054,366	5,030,336	4,162.588	4,195,732	435,184.395	4.446,572,698
1946	3,079,761	2,513,687	2,567,050	279,711,300	2,981,229,632	2.071,070	1.808.282	1,829,531	250,912.645	1.995,967,011	5,150.831	4,321,969	4.396,581	530,623,945	4,977,196,643
1947	3.091,977	2,629,727	2,683,253	300,474,560	3,281,704,192	2,074,806	1,831,975	1,871,099	254,946,244	2,250,913,255	5,166,783	4,461.702	4,554,352	555.420,804	5,532,617.447
1948	3,221,464	2,664,619	2.760,493	277.160,874	3,558.865,066	2,158,551	1,894.136	1,939,241	257.462,667	2,508.375,922	5,380,015	4,558,755	4,699,734	534,623,541	6,067,240,988
1949	3,296,297	2,792,108	2.848,896	277,347,763	3,836,212,829	2.382,215	2.028,481	2,067,338	238,981,245	2,747,357,167	5,678.512	4,820.589	4,916,234	516,329.008	6,583.569,996
1950	3.398,168	2,857,533	2,918,105	287,683,368	4,123,896,197	2,626,342	2,219,653	2,271.358	290,554,341	3,037,911,508	6,024,510	5,077,186	5,189,463	578,237,709	7,161,807,705
1951	4,049,409	3,596,094	3,624,299	445.407,191	4,569,303,388	2,663.606	2,279,675	2,317,714	376,314,474	3,414,225,982	6,713,015	5,875,769	5,942,013	821,721,665	7,983,529,370
1952	4,264,906	3,643,544	3,681,216	504,544.596	5,073,847,984	2,729,572	2,312,206	2,345,138	431,135,159	3,845,361,141	6,994,478	5,955,750	6,026,354	935,679,755	8,919,209,125

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[1] Includes projects constructed by the United States and those for which supplemental water is furnished from storage works built by the United States.
[2] Estimated.

Land Openings

During the fiscal year 1953, the Bureau opened for settlement 18,292 acres, comprising 263 farm units on the Columbia Basin and the Minidoka projects. The farm units on the Columbia Basin project were sold under the provisions of the Columbia Basin Project Act, while the farm units on the Minidoka project were opened for homestead entry under the provisions of the reclamation and homestead laws. The land opened on the Columbia Basin included 128 farm units comprising 9,840 acres of land in South Columbia Basin irrigation district, 11 farm units comprising 1,052 acres of land in the Quincy-Columbia Basin irrigation district, and 52 part-time farm units comprising 111 acres in the East Columbia Basin irrigation district. The opening on the Minidoka project involved 72 farm units comprising 7,289 acres of land on the North Side pumping division of the project.

The demand on the part of veterans for farm units made available for settlement continues to greatly exceed the supply. On the Columbia Basin land openings an average of 77 applications per farm unit were received. In 1 opening where only 11 units were offered a total of 3,558 applications were received or 323 applications per unit.

Veterans who have obtained farm units on reclamation projects are making a striking record of success as indicated by results of a survey of 1,186 settlers who have received farm units since 1946. Of the 863 farm units which have been occupied for 2 years or more, 97 percent are still held by the original settlers. Of the 168 occupied for 6 years, 76 percent are held by the original settlers. This is a remarkedly low rate of turnover of ownership. Approximately 50 percent of the units which have changed hands were transferred primarily for financial gain while other transfers were due to death or sickness, dislike of farming, inadequate finances, and other reasons. The average net worth of the settlers who have occupied their farms for 2 years or more is over $19,000.

Development Farms

The development farm program, begun in 1947 and proved to be of great value in demonstrating the solutions to problems faced by settlers on new irrigated areas, was continued in fiscal year 1953. To date 20 development farms have been established of which 3 have served their purpose and have been discontinued. Of the 17 farms now in operation on the Columbia Basin, Missouri River Basin, Gila, and Riverton project, 5 were established or the first crop was grown in fiscal year 1953.

The most efficient methods of irrigation, water requirements of crops, cropping practices, crops best adapted to the area, and other agricultural practices have been demonstrated through these farms.

Records and estimates show that there have been nearly 18,000 visits made to the farms by local settlers and others interested in the work.

Excellent cooperation has been given by several Department of Agriculture agencies and State agricultural colleges in conducting research in water use, fertilizers, crop diseases, and other special problems, on the 10 to 20 percent of each farm set aside for this purpose.

Repayment and Water Service Contracts

During fiscal year 1953 repayment contracts, having a face value of over $85 million, were entered into with over 50 irrigation districts to assure the return of the cost of construction of irrigation works and for municipal water service on new projects. In addition, delivery of water to a number of other contracting organizations is provided for by water service type contracts executed during the year with various irrigation districts and municipalities. Amendatory repayment contracts were entered into with 16 irrigation districts on 5 Federal reclamation projects involving the repayment of some $36 million. Enactment of special legislation by the Congress during the year was necessary in connection with the execution of most of the amendatory contracts. Amendatory contract negotiations have been completed or are in advance stages with other districts involving repayment obligations in excess of $41 million.

Rehabilitation and Betterment

The rehabilitation and betterment program of the Bureau of Reclamation was continued during fiscal year 1953 in order to take care of deferred maintenance items on some of the older reclamation projects. Full reimbursement by the water users of all funds expended for the program is required.

Allotments from the $2,342,000 appropriated by the Congress for this work during fiscal year 1953 were made to 11 projects. The work performed on these projects included replacement of deteriorated wood structures; repair or replacement of failing concrete and steel structures; cleaning and repair of canals, laterals, wasteways, and drains; installation of canal lining to prevent excessive water losses; construction of drains; and the construction and repair of operating roads, cattleguards, fences, and many other items as required to place the projects in good operating condition.

Soil and Moisture Conservation Operations

Efforts were continued on the control of erosion on public lands under reclamation jurisdiction; protection of reservoirs, canals, and other irrigation works from siltation; and prevention of water losses detrimental to irrigation projects.

This work is accomplished throughout the 17 Western States by individual effort of the Bureau of Reclamation and through effective cooperation with all other interested agencies in each of the areas concerned.

Typical activities were the stabilization and conservation of public lands in the Columbia Basin, and on watershed areas tributary to reservoirs of the Central Valley project, through revegetation, structures, etc.; the cooperative program with the Bureau of Land Management for control of erosion in the Book Cliffs area, Colorado, for benefit of public lands and protection of reclamation structures of the Grand Valley project; construction for control of erosion for protection of the main canal and structures of the Rio Grande project, New Mexico; and increased construction for prevention of further erosion of Five Mile and Muddy Creeks above the Boysen Reservoir in Wyoming.

Drainage

Extensive drainage investigations were conducted on projects as required for the planning of adequate drainage facilities. In some instances certain phases of these investigations were performed by the Geological Survey through cooperative memoranda of agreement.

In recent years there has been a general intensification of drainage activities on the older projects. Much of the construction has been financed directly by the water users with only technical supervision provided by the Bureau of Reclamation. However, where drainage systems are necessary and feasible but are beyond the ability of the water users to finance through regular operation and maintenance assessments, drainage has been accomplished through the rehabilitation and betterment program.

Recreational Use of Reservoirs

Construction of dams and reservoirs for irrigation and power development provides incidental but very definite benefits to the public through the creation of exceptional recreational opportunities. This is particularly true in the more arid parts of the West.

Except in the Missouri River Basin, the Bureau of Reclamation is not authorized to expend funds for recreational development of reservoir areas. At certain reservoirs where recreational possibilities are deemed to be of national significance, such as Lake Mead, on the Colorado River between Arizona and Nevada; Franklin D. Roosevelt

Lake, on the Columbia River in Washington; Millerton Lake, on the San Joaquin River in California; and Shadow Mountain and Granby Lakes on the Colorado River in Colorado, responsibility for the development and administration of recreational facilities has been delegated to the National Park Service. The National Park Service is, in effect, the agent of the Bureau in recreational matters and negotiates for the development and administration, by local or State governmental agencies, of reservoir areas which are of local or State significance. At certain reservoirs located within the National Forest boundaries, recreational facilities are administered by the United States Forest Service.

Flood Control Operations

During the past year the principal early season flood threat was in the Sacramento River Basin where Shasta Dam was operated to control heavy floods. Discharge from the reservoir was at maximum rates in order to lower the reservoir in advance of further flooding, and resulted in the inundation of some flood-plain land downstream.

Late season flood threats developed in the upper Missouri River Basin where unusual rains resulted in large floods on the Sun and Milk Rivers. Some degree of regulation of these floods was afforded by Bureau structures.

Flood control operations were coordinated, where possible, with those of the Corps of Engineers and storage facilities in many locations are integrated for maximum flood protection. During the year, rules for the operation of Shasta Dam were agreed to by the Corps and Bureau and published in the Federal Register.

Lower Cost Canal Lining

Concerned over the fact that so much of the water diverted from streams and reservoirs was lost in transit before it reached the farmers' fields and that the costs of making canals and laterals reasonably watertight were excessive, the Bureau of Reclamation initiated this special investigations program in 1946. The investigations have included laboratory work in Denver and experimental field installations throughout the West.

As a result of the use of the findings and developments under this program, annual savings in water and reduced maintenance costs have been made amounting to an estimated $2,269,000.

Many special reports were prepared on canal losses, seepage studies, laboratory investigations, and condition surveys of existing linings. A bulletin titled, "Canal Linings and Methods of Reducing Costs" has been made available to the general public through the Superintendent of Documents, U. S. Government Printing Office.

Weed Control

Further progress was made in developing more permanent and economical methods for controlling weeds which constitute a major operation and maintenance problem on irrigation systems.

The research work has been accomplished principally at the four western weed control stations established for this purpose by the Bureau of Plant Industry and at the Bureau of Reclamation laboratories in Denver. Initial findings from the use of radioactive materials in tracing movement and concentration of herbicides in plant tissues are aiding in determining the most effective stage of weed growth for applying control chemicals.

The application of research findings to the weed control program on irrigation systems has reduced considerably the operating problems and costs during the year and has saved many acre feet of water which would have been lost through transpiration and seepage due to weeds. On many projects water weeds, which reduce the carrying capacity of canals, were successfully treated with aromatic solvents developed in the Bureau of Reclamation laboratories. Working out more effective methods and equipment for applying 2,4–D has solved largely the annual weed and willow problems on canal banks. The program was continued for developing means of adapting this new chemical to the control of salt cedar which causes serious water losses, reduces land use efficiency and threatens farm lands and towns with inundation during flash floods in the Southwest.

The use of motion pictures, slide lectures, Reclamation Era articles, handbooks and other educational media prepared by the Bureau has been continued to keep Federal and private projects abreast of new developments in weed control. During the year a new handbook was written and distributed on equipment used for weed control on irrigation systems.

Cooperation With Agricultural Agencies

The Bureau has maintained close working relations with State colleges and extension services and with agencies of the Department of Agriculture. Many of the cooperative undertakings making research data available to settlers are provided for in memoranda of understanding or cooperative agreements between the agencies concerned. Some of these memoranda have been in effect for a number of years while others are of recent origin. During the year 125 agreements were in effect, 37 of which were executed during the fiscal year.

Federal Tax Revenues and Reclamation

Based on the projected results of a sample study of 15 reclamation projects, the cumulative return to the Treasury from the 70 odd projects or divisions of projects receiving water under the Federal reclamation program in 1952 now stands at over $2.7 billion. This is an amount greater than total reclamation expenditures for all project works either complete or incomplete since the beginning of the Federal reclamation program in 1902. It has accumulated from projects involving less than half of total irrigation feature costs incurred to date and thus presages accelerating revenues as the great projects of the Columbia Basin, Missouri River Basin, and Central Valley of California reach full production.

In 1952 individual income taxes paid directly by irrigation farmers and by persons of the neighboring towns and villages whose business or employment was affected by the construction of 15 selected reclamation projects were estimated at $105 million. The aggregate individual income tax revenues from this sample study area since 1916 is estimated at over $700 million. In addition to individual tax revenues, an appropriate share of corporation and excise tax revenues collected in the same 15 project areas is directly attributable to reclamation development. Estimated receipts from these sources total nearly $400 million. The combined returns from individual and corporate tax revenues accordingly are estimated at $1.1 billion. Total Federal project construction cost through June 30, 1952, for the same projects aggregates $264 million. Thus far, Federal taxes collected have exceeded the Federal investment in irrigation features in these projects by 4½ times. These revenues are in addition to the obligation voluntarily assumed by direct users of water to repay to the Government the total cost of irrigation features allocated for repayment.

POWER UTILIZATION

Installation and production of hydroelectric power capacity increased on the multipurpose projects of the Bureau of Reclamation during fiscal year 1953.

By June 30, 1953, the total installed capacity in powerplants constructed and operated by the Bureau of Reclamation was 4,421,200 kilowatts. The increase of 240,000 kilowatts, together with existing facilities, served market areas in the western United States with electric energy for industrial and domestic purposes.

The sale of electric energy during the fiscal year totaled 25,850,471,408 kilowatt-hours, which brought in revenues of $44,963,079.82 to the Treasury. A summary of fiscal year 1953 power sales and revenues by projects is shown in table 7 on page 170.

Outstanding accomplishments in hydroelectric power production shown in annual reports from the Bureau's regional offices, include the following:

A new world's record in peak generation of power for 1 hour in a single plant was set in the Grand Coulee powerplant on August 16, 1952, when 2,309,000 kilowatt-hours were generated. The plant's nameplate rating is 1,974,000 kilowatts. Other world records set in the same month were: Daily generation, 52,660,000 kilowatt-hours; weekly generation, 356,048,000 kilowatt-hours; and monthly generation, 1,514,140,000 kilowatt-hours. Grand Coulee Dam contributed about 40 percent of all hydroelectric energy used in the Pacific Northwest in 1953. The sale of power repaid approximately $11,000,000 to the Federal Treasury in the fiscal year, making a total of $85,818,680 repaid to date.

TABLE 7.—Bureau of Reclamation power systems, power sales, and revenues by projects, fiscal year ending June 30, 1953 [1]

Projects	Sales of electric energy, kilowatt-hours	Revenues from sales
Boise project	161, 408, 313	$359, 934. 93
Columbia Basin project [2]	13, 632, 718, 300	11, 321, 814. 43
Minidoka project	118, 356, 636	480, 859. 12
Yakima project	24, 952, 330	64, 202. 92
Hungry Horse project [3]	132, 740, 320	825, 889. 17
Central Valley project	2, 204, 304, 705	8, 904, 842. 06
Boulder Canyon project	6, 441, 415, 692	10, 228, 140. 60
Parker-Davis project	1, 757, 032, 226	5, 274, 196. 25
Yuma project	10, 284, 399	42, 349. 19
Rio Grande project	158, 064, 077	1, 041, 604. 11
Fort Peck project	537, 390, 515	1, 968, 898. 98
North Platte project	56, 335, 278	476, 726. 32
Missouri River Basin—Western Division, comprising power systems of Riverton, Shoshone, Colorado-Big Thompson, Kendrick, and Missouri River Basin western division projects	607, 645, 696	3, 940, 006. 96
Missouri River Basin, eastern division	7, 822, 921	33, 614. 78
Grand total	25, 850, 471, 408	44, 963, 079. 82

[1] Does not include energy sales and revenues in transactions between Bureau projects.

[2] Totals include 13,241,243,894 kilowatt-hours delivered to Bonneville Power Administration for marketing and $11,100,000 in payments by that agency, which includes $187, 570 river regulation benefits.

[3] Totals include 125,398,360 kilowatt-hours delivered to Bonneville Power Administration for marketing and $781,000 in payments by that agency.

Installation during the year of the first 2 units of the Hungry Horse project increased to 7 the number of Bureau hydroelectric plants in region 1. These produced 14,087,207,384 kilowatt-hours (net generation) during the year to earn a gross revenue of $13,052,701.

At the close of fiscal year 1953, the Central Valley project was serving, in addition to project loads, 19 preference customers, 16 by wheeling and 3 by direct connection to project-owned facilities. Total power sales amounted to 2,067,700,000 kilowatt-hours, and power income totaled $8,563,000; 92 percent of this power was sold to the Pacific Gas & Electric Co. In addition to commercial power sales, energy use for project loads including pumping was 136,570,000 kilowatt-hours.

Reclamation hydroelectric plants at Hoover, Davis, and Parker Dams and Siphon Drop on the Yuma project generated a record 8½ billion kilowatt-hours of energy. This is estimated to be about 39 percent of the energy consumed in the Pacific Southwest during the year.

Studies were advanced on power aspects of the potential Colorado River storage project, which by a series of dams on the Colorado River and its major tributaries would develop 1,622,000 kilowatts of generating capacity.

Total energy on the power system of the Rio Grande project for fiscal year 1953 amounted to 168,594,277 kilowatt-hours, of which 49,034,640 kilowatt-hours were generated by the hydroelectric plant at Elephant Butte Dam, N. Mex., and 119,559,637 kilowatt-hours were receipts from other systems.

The region 6 power transmission system, including the Missouri River Basin project, Fort Peck project, and the integrated features of the Riverton and Shoshone projects in the Big Horn Basin, now comprises 3,045 miles of completed transmission lines, of which all but 501.5 miles are energized, and 58 substations with a capacity of 430,250 kilovolt-amperes which have been energized. Total gross power revenues for fiscal year 1953 were $2,748,054, with net generation from Federal hydroelectric plants in the region for which the Bureau markets the power amounting to 784.9 million kilowatt-hours. Comparable amounts for fiscal year 1952 were $2,203,024, and 592 million kilowatt-hours. The increases are due to the start of power production by Boysen powerplant, the reflection of full-year operation of the additional unit at Fort Peck and Angostura powerplant (completed in fiscal year 1952 but not in operation for the entire year) and increasing loads.

The 7 hydroelectric powerplants in region 7 with a generating capacity of 149,300-kilowatts generated 496,952,400 kilowatt-hours of electrical energy during the fiscal year which were sold to municipalities, REA cooperatives, industrial plants, and public utilities for a gross revenue of $3,671,198.17.

Present Installed Capacity

During the fiscal year ending June 30, 1953, the Bureau had 26 powerplants with a total nameplate capacity of 4,421,200 kilowatts, an increase of 240,000 kilowatts capacity over the fiscal year 1952 figures. The capacity installed during fiscal year 1953 is as follows:

	Kilowatts
Boulder Canyon project	82, 500
Missouri River Basin project	15, 000
Hungry Horse project	142, 500
Total	240, 000

Powerplants operated by other agencies, principally water users' organizations, on reclamation projects totaled 16, of which 9 were originally constructed by the Bureau. These 9 plants have an installed capacity of 30,827 kilowatts; the 7 other plants constructed by the water users' organizations have an installed capacity of 82,500 kilowatts, an increase during fiscal year 1953 of 10,000 kilowatts.

Additional Capacity Under Construction

At the end of fiscal year 1953, the Bureau of Reclamation had under construction 14 new powerplants, which will have an ultimate installed nameplate capacity of 525,850 kilowatts.

The United States Army Corps of Engineers is proceeding with the construction of its plants on the Missouri River Basin project. The Bureau of Reclamation will be the marketing agent for energy generated by all plants constructed by the Corps on the Missouri River Basin project.

Authorized to be constructed by the Bureau of Reclamation as of June 30, 1953, are 28 powerplants, with a total capacity of 1,023,300 kilowatts.

The status of hydroelectric powerplants on Reclamation projects is shown in table 8.

TABLE 8.—United States Department of the Interior—Hydroelectric plants on reclamation projects—Operating, under construction, or authorized as of June 30, 1953

A. CONSTRUCTED AND OPERATED BY BUREAU OF RECLAMATION

State	Project	Name of plant	Calendar year of initial operation	Nameplate capacity		Number and nameplate capacity of generators	
				Existing (kilowatts)	Ultimate (kilowatts)	Existing (kilowatts)	Ultimate (kilowatts)
Arizona-Nevada	Boulder Canyon	Hoover [1]	1936	1,249,800	1,354,300	14-82,500; 1-40,000; 2-2,400; 1-50,000.	14-82,500; 1-40,000; 1-50,000; 2-2,400; 1-104,500.
Do	Davis Dam	Davis	1951	225,000	225.000	5-45,000	5-45,000.
Arizona-California	Parker	Parker	1942	120,000	120,000	4-30,000	4-30,000.
California	Central Valley	Keswick	1949	75,000	75,000	3-25,000	3-25,000.
Do	do	Shasta	1944	379,000	379,000	5-75,000; 2-2,000	5-75,000; 2-2,000.
Do	Yuma	Siphon Drop	1926	1,600	1,600	2-800	2-800.
Colorado	Colorado-Big Thompson	Estes	1950	45,000	45,000	3-15,000	3-15,000.
Do	do	Green Mountain	1943	21,600	21,600	2-10,800	2-10,800.
Do	do	Marys Lake	1951	8,100	8,100	1-8,100	1-8,100.
Idaho	Boise	Anderson Ranch	1950	27,000	[2] 40,500	2-13,500	3-13,500.[2]
Do	do	Black Canyon	1925	8,000	8,000	2-4,000	2-4,000.
Do	do	Boise Diversion	1912	1,500	1,500	3-500	3-500.
Do	Minidoka	Minidoka	1909	13,400	13,400	1-5,000; 1-2,400; 5-1,200	1-5,000; 1-2,400; 5-1,200.
Montana	Hungry Horse	Hungry Horse	1952	142,500	285,000	2-71,250	4-71,250.
New Mexico	Rio Grande	Elephant Butte	1940	24,300	24,300	3-8,100	3-8,100.
South Dakota	Missouri Basin	Angostura	1951	1,200	1,200	1-1,200	1-1,200.
Washington	Columbia	Grand Coulee [3] [4]	1941	1,974,000	1,974,000	18-108,000;[4] 3-10,000	18-108,000;[4] 3-10,000.
Do	Yakima	Prosser [5]	1932	2,400	2,400	1-2,400	1-2,400.
Wyoming	Kendrick	Seminoe	1939	32,400	32,400	3-10,800	3-10,800.
Do	Missouri River Basin	Boysen	1952	15,000	15,000	2-7,500	2-7,500.
Do	do	Kortes	1950	36,000	36,000	3-12,000	3-12,000.
Do	North Platte and Missouri River Basin.	Guernsey	1927	4,800	14,800	2-2,400	2-2,400; 1-10,000.
Do	North Platte	Lingle	1919	1,400	1,400	2-400; 2-300	2-400; 2-300.
Do	Riverton	Pilot Butte	1925	1,600	1,600	2-800	2-800.
Do	Shoshone	Heart Mountain	1948	5,000	5,000	1-5,000	1-5,000.
Do	do	Shoshone	1922	5,600	5,600	1-4,000; 2-800	1-4,000; 2-800.
Subtotal A				4,421,200	4,691,700		

See footnotes at end of table.

TABLE 8.—United States Department of the Interior—Hydroelectric plants on reclamation projects—Operating, under construction, or authorized as of June 30, 1953—Continued

B. CONSTRUCTED BY BUREAU OF RECLAMATION: OPERATED BY OTHERS

State	Project	Name of plant	Calendar year of initial operation	Nameplate capacity: Existing (kilowatts)	Nameplate capacity: Ultimate (kilowatts)	Number and nameplate capacity of generators: Existing (kilowatts)	Number and nameplate capacity of generators: Ultimate (kilowatts)
Arizona	Salt River	Arizona Falls [6]	1913	850	850	2-425	2-425.
Do	do	Cross Cut [6]	1914	5, 100	5, 100	1-3,000; 3-700	1-3,000; 3-700.
Do	do	Roosevelt	1909	15, 400	15, 400	5-1,080; 1-4,000; 1-6,000	5-1,080; 1-4,000; 1-6,000.
Do	do	South Consolidated [6]	1912	1, 600	1, 600	2-800	2-800.
Colorado	Grand Valley	Grand Valley (Palisade)	1932	3, 000	3, 000	2-1,500	2-1,500.
Nevada	Newlands	Lahontan	1911	1, 640	1, 640	1-640; 2-500	1-640; 2-500.
Oregon	Deschutes	Cove [7]	1946	1, 500	1, 500	1-1,500	1-1,500.
Utah	Strawberry Valley	Spanish Fork [8]	1908	1, 550	1, 550	2-450; 1-250; 1-400	2-450; 1-250; 1-400.
Washington	Yakima	Rocky Ford	1916	187	187	1-187	1-187.
Subtotal B				30, 827	30, 827		

C. CONSTRUCTED AND OPERATED BY WATER USERS ORGANIZATIONS

State	Project	Name of plant	Calendar year of initial operation	Nameplate capacity: Existing (kilowatts)	Nameplate capacity: Ultimate (kilowatts)	Number and nameplate capacity of generators: Existing (kilowatts)	Number and nameplate capacity of generators: Ultimate (kilowatts)
Arizona	Salt River	Chandler [9]	1919	600	600	1-600	1-600.
Do	do	Horse Mesa [9]	1927	30, 000	30, 000	3-10,000	3-10,000.
Do	do	Mormon Flat [9]	1926	7, 000	7, 000	1-7,000	1-7,000.
Do	do	Stewart Mountain [9]	1930	10, 400	10, 400	1-10,400	1-10,400.
California	All-American Canal	Drop Nos. 3 and 4 [10]	1941	34, 000	34, 000	1-5,200; 3-9,600	1-5,200; 3-9,600.
Oregon	Klamath	C Canal Drop [11]	1938	500	500	1-500	1-500.
Subtotal C				82, 500	82, 500		

D. CONSTRUCTED AND OPERATED BY CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY: POWER MARKETED BY BUREAU OF RECLAMATION

State	Project	Name of plant	Calendar year of initial operation	Nameplate capacity: Existing (kilowatts)	Nameplate capacity: Ultimate (kilowatts)	Number and nameplate capacity of generators: Existing (kilowatts)	Number and nameplate capacity of generators: Ultimate (kilowatts)
Montana	Fort Peck	Fort Peck	1943	85, 000	185, 000	2-35,000; 1-15,000	3-35,000; 2-40,000.

E. UNDER CONSTRUCTION BY BUREAU OF RECLAMATION

Alaska	Eklutna	Eklutna	1955	0	30,000	0	2-15,000.
California	Central Valley	Folsom	1955	0	162,000	0	3-54,000.
Do	do	Nimbus	1955	0	13,500	0	2-6,750.
Colorado	Colorado-Big Thompson	Flatiron	1953	0	71,500	0	2-31,500; 1-8,500.
Do	do	Polehill	1953	0	33,250	0	1-33,250.
Idaho	Palisades	Palisades	1956	0	114,000	0	4-28,500.
Montana	Missouri River Basin	Canyon Ferry	1953	0	50,000	0	3-16,666.
Do	do	Kenil	1962	0	1,600	0	2-800.
Do	do	Tiber	1957	0	2,000	0	3-667.
Washington	Yakima-Kennewick division.	Chandler	1955	0	12,000	0	2-6,000.
Wyoming	Kendrick	Alcova	1954	0	36,000	0	2-18,000.
Subtotal E				0	525,850		

F. UNDER CONSTRUCTION BY CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY: POWER TO BE MARKETED BY BUREAU OF RECLAMATION

North Dakota	Missouri River Basin	Garrison	1955	0	400,000	0	5-80,000.
South Dakota	do	Fort Randall	1953	0	320,000	0	8-40,000.
Do	do	Gavins Point	1956	0	100,000	0	3-33,333.
Do	do	Oahe	1960	0	425,000	0	5-85,000.
Subtotal F				0	1,245,000		

G. AUTHORIZED TO BE CONSTRUCTED BY BUREAU OF RECLAMATION

California	Central Valley	Trinity	1959	0	75,000	0	3-25,000.
Do	do	Lewiston	1958	0	2,000	0	1-2,000.
Do	do	Tower House	1958	0	66,000	0	3-22,000.
Do	do	Matheson	1958	0	75,000	0	3-25,000.
Colorado	Collbran	Molina	1958	0	5,500	0	1-5,500.
Do	do	Cameo	1959	0	2,500	0	1-2,500.
Do	Colorado-Big Thompson	Big Thompson		0	6,700	0	1-6,700.
Idaho	Minidoka	American Falls	1956	0	30,000	0	4-7,500.
Montana	Missouri River Basin	Lyon	1961	0	24,000	0	3-8,000.
Do	do	Absaroka	1961	0	50,000	0	3-16,667.
Do	do	Portage	1960	0	20,000	0	2-10,000.
Do	do	Yellowtail	1958		200,000	0	4-50,000.
Do	do	Moorhead	1960	0	8,000	0	2-4,000.
Do	do	Reichle		0	20,000	0	2-10,000.
Do	do	Little Porcupine		0	18,000	0	3-6,000.
Nebraska	do	Harlan		0	1,200	0	1-1,200.
South Dakota	do	Pony Hills	1961	0	180,000	0	4-45,000.

See footnotes at end of table.

TABLE 8.—United States Department of the Interior—Hydroelectric plants on reclamation projects—Operating, under construction, or authorized as of June 30, 1953—Continued

G. AUTHORIZED TO BE CONSTRUCTED BY BUREAU OF RECLAMATION—Continued

State	Project	Name of plant	Calendar year of initial operation	Nameplate capacity		Number and nameplate capacity of generators	
				Existing (kilowatts)	Ultimate (kilowatts)	Existing (kilowatts)	Ultimate (kilowatts)
Utah	Weber Basin	Gateway	1957	0	4,000	0	2-2,000.
Do	do	Wanship	1957	0	1,400	0	1-1,400.
Do	Provo River Basin	Deer Creek	1956	0	5,000	0	2-2,500.
Washington	Yakima-Roza division	Roza	1956	0	10,000	0	2-5,000.
Wyoming	Missouri River Basin	Bald Ridge	1959	0	30,000	0	3-10,000.
Do	do	Hunter Mountain	1962	0	12,000	0	2-6,000.
Do	do	Sunlight	1960	0	20,000	0	2-10,000.
Do	do	Thief Creek	1960	0	60,000	0	3-20,000.
Do	do	Tongue River	1960	0	25,000	0	2-12,500.
Do	do	Glendo	1959	0	24,000	0	2-12,000.
Do	do	Fremont Canyon	1959	0	48,000	0	2-24,000.
Subtotal G				0	1,023,300		

H. AUTHORIZED TO BE CONSTRUCTED BY CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY: POWER TO BE MARKETED BY BUREAU OF RECLAMATION

State	Project	Name of plant	Calendar year of initial operation	Existing (kilowatts)	Ultimate (kilowatts)	Existing (kilowatts)	Ultimate (kilowatts)
California	Central Valley	Iron Canyon		0	54,000	0	3-18,000.
South Dakota	Missouri River Basin	Big Bend	1960	0	120,000	0	6-20,000.
Subtotal H				0	174,000		
Total				4,619,527	7,958,177		

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[1] Powerplant units operated by power allottees under agency contract.

[2] 27,000 kilowatts authorized; space provided in plant for 3d unit.

[3] Power marketed by Bonneville Power Administration.

[4] Main units with a nameplate rating at 108,000 kilowatts have continuous operating capacity of 120,000 kilowatts.

[5] Prosser will be removed when Chandler is constructed.

[6] Powerplant constructed by Bureau of Reclamation with Salt River Valley Water Users' Association funds.

[7] Unit No. 3 installed in Pacific Power & Light Co's. Cove No. 2 plant.

[8] 3 plants: (*a*) Spanish Fork (upper); (*b*) Spanish Fork (lower); (*c*) Payson.

[9] Salt River Valley Water Users' Association's plant.

[10] Imperial Irrigation District's plant.

[11] Enterprise Irrigation District's plant.

Transmission Lines

On June 30, 1953, the Bureau of Reclamation's transmission system consisted of 8,433 miles of lines. During fiscal year 1953, 1,938 miles of transmission lines were completed. These are shown in the following table 9.

TABLE 9.—Transmission lines completed during fiscal year 1953

Project and line	Voltage (kilovolts)	In service date	Circuit-miles
Hungry Horse (Montana): Hungry Horse powerplant to switchyard.	230	(2)	0.7
Central Valley (California):			
Portion of Shasta-Tracy line 1	230	October 1952	192.7
Portion of Shasta-Tracy line 2	230	do	192.5
Clayton pumping plant-Port Chicago substation	69	November 1952	1.1
Colorado-Big Thompson (Colorado):			
Flatiron switchyard to Fort Collins-Cheyenne tap	115	September 1952	34.8
Salida substation to Gunnison substation	115		55.6
Granby substation to Willow Creek pumping plant	69	(2)	.7
Estes powerplant to Pole Hill powerplant	115	(2)	8.4
Kendrick (Wyoming): Portion of Seminoe powerplant to Baroil substation.	34.5	July 1952	35.8
Fort Peck (Montana): Dawson substation to Williston substation	115	(2)	91.1
Missouri River Basin:			
Temporary Garrison substation to Bismarck substation	115	November 1952	68.4
Neal powerplant to Washburn substation	115	December 1952	76.1
Jamestown substation to Valley City substation	115	September 1952	35.0
Fort Randall powerplant to Winner substation	69	October 1952	74.2
Near Brookings West	69	do	23.6
Huron-Mount Vernon	69	November 1952	53.4
Mount Vernon-Armour	69	December 1952	29.9
Bismarck substation to MDU powerplant	69	November 1952	4.2
Julesburg tap	115	January 1953	7.1
Thermopolis substation to Lovell substation	115	May 1953	84.3
Garland substation to Lovell substation	69	do	18.5
Rapid City substation to Midland substation	115	January 1953	114.1
Brookings substation to Watertown substation	115	May 1953[1]	50.3
Watertown substation to Groton substation to Huron substation	115	June 1953[1]	156.2
Sioux Falls substation to Brookings substation	115	(2)	59.7
Armour substation to Gavins Point tap	115	(2)	63.3
Gavins Point to Sioux Falls substation	115	(2)	94.6
Edgely substation to Formal substation	69	January 1953	66.4
Washburn substation to Bismarck substation	230	May 1953	42.0
Bismarck substation to Jamestown substation	230	do	98.3
Tiber tap to Tiber construction substation	115	do	11.9
Canyon Ferry switchyard to Canyon Ferry tap	115	(2)	14.4
Carrington substation to Jamestown substation	115	September 1942	48.4
Miscellaneous short taps and lines			30.4
Total			1,938.1

[1] Only a portion of line in service.

(2) Construction completed, but line not placed in service before June 30, 1953.

Power Contracts

During fiscal year 1953, 82 contracts for delivery of power were executed. Included among these are:

Number of contracts:
- 8 with private utilities
- 33 with REA cooperatives
- 17 with municipalities
- 5 with other Federal agencies
- 8 with irrigation districts
- 2 with public power districts
- 4 with State authorities
- 5 miscellaneous-type contracts

A number of contracts executed were renewals of operating contracts or revisions of existing contracts resulting from changed operating conditions.

The Bureau continued its policy of contracting whenever possible with private utilities and cooperatives for wheeling power and energy over existing facilities. The Bureau also entered into several interchange agreements with cooperatives and utilities.

A summary by classification of customers served by Reclamation during 1953 is shown in table 10.

TABLE 10.—Summary of classification of customers for 12 months ending June 30, 1953 [1]

Type of customers	Number of customers	Sales of electric energy	Revenue from sales of electric energy
		Kilowatt-hours	
Privately owned utilities	33	5, 244, 891, 658	$14, 885, 886. 51
Municipal utilities	33	3, 044, 778, 403	4, 949, 523. 27
State Government utilities	10	2, 349, 492, 277	6, 457, 293. 59
Cooperative utilities (Rural Electrification Administration projects)	95	466, 793, 401	2, 904, 582. 61
Other Federal utilities [2]	5	13, 435, 336, 330	12, 127, 917. 04
Residential and domestic	480	6, 523, 992	38, 754. 83
Rural (other than Rural Electrification Administration projects)	8	117, 531	1, 049. 92
Commercial and industrial	30	85, 394, 037	477, 490. 24
Public authorities	65	601, 373, 793	2, 325, 562. 78
Interdepartmental	58	615, 769, 986	795, 019. 03
Total all customers	817	25, 850, 471, 408	44, 963, 079. 82

[1] Does not include energy sales and revenues in transactions between Bureau projects.

[2] Totals include 13,366,642,254 kilowatt-hours delivered to Bonneville Power Administration for marketing and $11,881,000 in payments by that agency.

The Bureau of Reclamation at the end of fiscal year 1953 had 255 contracts under active negotiation. In this number are included 67 contracts with municipalities, 100 with REA cooperatives, 26 with private utilities, 7 with public power districts, 19 with other Federal agencies, 13 with State authorities, 9 with irrigation districts, and 14 miscellaneous-type contracts. A number of these are to renew the existing contracts or to revise contracts in existence due to changes in operating conditions. Some of the contracts under negotiation are for future power deliveries at such time as additional generating capacity now under construction is placed in operation.

PROJECT PLANNING

The Bureau of Reclamation's project planning program provides for the planning for new projects for utilization of the water resources of the West. Also, in recent years, the Congress has made appropriations of funds to the Bureau for investigations in Alaska relating to the development of water resources as a basis for legislation, and for reports thereon to Congress. The emphasis of the Bureau program is being placed on those projects which could contribute to the maintenance of the essential civilian economy by providing full and supplemental irrigation water, hydroelectric power, municipal water, and other services in critical areas.

Comprehensive River Basin Surveys

During the 1953 fiscal year the Bureau of Reclamation, pursuant to a directive from the President, continued the Arkansas, White, and Red River Basin investigations in cooperation with the other interested Federal agencies under the field committee established by the Federal Interagency River Basin Committee on June 12, 1950.

The report on the survey of the Washita River, Okla., a subbasin of the Red River Basin, which was completed and reviewed by the affected States and Federal agencies in fiscal year 1952, was under review by the Bureau of the Budget in fiscal year 1953. Legislation was introduced in Congress to authorize projects in this basin.

New Projects Authorized

The Collbran project, Colorado, was authorized by specific act of Congress approved July 3, 1952.

The Interior Department Appropriation Act, 1953, provided funds for emergency rehabilitation of Savage Rapids Dam of the Grants Pass project, Oregon.

The Secretary of the Interior submitted the report on the Sacramento Canals unit of the Sacramento River Division, Central Valley project, California, to the Congress on January 19, 1953, with a finding of feasibility. The report was printed as House Document 73, 83d Congress. An act of Congress approved September 26, 1950, authorized this unit but provided that no funds could be expended for construction until the Secretary of the Interior, with the approval of the President had submitted to the Congress a completed report and a finding of feasibility under the provisions of Federal reclamation law.

The report on the Trinity River Division of the Central Valley project was approved by the President and submitted to the Congress on January 2, 1953, with a finding of feasibility by the Secretary authorizing the project under reclamation law. The report was printed as House Document 53, 83d Congress.

The report on the Deer Creek powerplant of the Deer Creek Division, Provo River project, Utah, was forwarded to the Congress on

September 10, 1952, with a finding of feasibility made by the Secretary on August 20, 1951. The report was printed as House Document 37, 83d Congress.

Other Project Planning Reports

Bills were introduced in Congress to authorize the Fryingpan-Arkansas project, Colorado, and the Santa Maria project, California, and for irrigation features of the Chief Joseph Dam project, Washington, and reauthorization of the Eklutna project in Alaska, and hearings were held. Other bills were introduced to authorize the Canton project, Oklahoma; Central Arizona project, Arizona; Bridge Canyon Dam, Ariz.; Colorado River storage project and participating projects, Arizona, Colorado, New Mexico, Utah, Wyoming; Michaud Flats project, Idaho; Santa Margarita project, California; Snake River project, Idaho, Oregon; and Washita River subbasin project, Oklahoma, Texas.

The report on the Fryingpan-Arkansas project was submitted to the Congress in June 1953 and was printed as House Document 187, 83d Congress. Also the report on a domestic water system for the Deschutes project, Oregon, was submitted to the Congress in November 1952.

Reports on the following projects were submitted to the Congress in the last half of fiscal year 1953 but none of these reports included recommendations for construction:

Braziel Dam and Reservoir, Fort Laramie division, North Platte project, Nebraska
Fort Gibson project, Oklahoma
Lower Nueces River project, Texas
Payette Heights unit, Payette division, Boise project, Idaho

Reports on the North Fork Kings unit of the Kings River division, Central Valley project (ultimate plan), California, and the Swan Lake project, Alaska, were reviewed by the Bureau of the Budget in the 1953 fiscal year.

Reports on the Canton project, Oklahoma; the Colorado River storage project and participating projects, Colorado, New Mexico, Utah, Wyoming, and Arizona; and the Santa Maria project, California, were submitted to the President in fiscal year 1953 and were under review by the Bureau of the Budget at the end of the fiscal year.

River Compacts

During fiscal year 1953 there was little definite accomplishment on interstate river-basin compacts in the Western States. However, the

Bureau of Reclamation continued throughout the year to give assistance in every way practical to the State and Federal representatives working on negotiation of compacts or on administration of compacts in effect. Among those compacts under negotiation only one, the Sabine River compact, showed progress. After adoption of a number of amendments suggested by the Department of the Interior, draft of the document was approved by the commissioners for the States of Texas and Louisiana and by the Federal representative and ratified by the State of Texas.

The Bureau similarly assisted the various commissions in administering the interstate water-use problems. Outstanding among such actions is the participation of the Bureau in the work of the Upper Colorado River Commission.

Hydrology

During fiscal year 1953, progress was made in many aspects of the basic hydrology fields of sediment, flood control, water supply, and forecasting.

A report on the use of water on Federal irrigation projects was issued during the year, and work was continued in accordance with the recommendations in the report regarding procedures for improving estimates of water requirements. A report on water supply of the Lower Colorado River Basin was completed during the year. Hydrologic studies continued during the year for the purpose of improving the determination of facilities required to protect structures against flood occurrence. An example of the latter was the field study of the extreme rainstorm of May–June 1953 in the vicinity of Great Falls, Mont.

Progress was made in the improvement of forecasting procedures by statistical methods, in expansion and testing of such procedures and saving of time and expense of computation by the use of electronic computing machines. A revised edition of Engineering Monograph No. 2, Multiple Correlation in Forecasting Seasonal Runoff, was issued in June 1953. This report describes procedures and advance techniques for use in forecasting project water supplies.

A technical report was published on the evaporation investigations conducted cooperatively by the Bureau of Reclamation, Geological Survey, and United States Navy Electronics Laboratory at Lake Hefner, Okla.

Intensive sedimentation studies and investigations were continued in the Rio Grande Basin in connection with the channelization program for the Middle Rio Grande Valley. A new method of determining the total suspended sediment load of streams, based on analysis of the vertical distribution of suspended sediments, was developed. Sedimentation survey reports were prepared for Pathfinder and Seminoe Reservoirs on the North Platte River in Wyoming. A report was completed on channel-erosion control for Fivemile Creek, a tributary of the Bighorn River in Wyoming, alleged to be the major contributor of sediment in the Upper Missouri River Basin.

During fiscal year 1953, studies were continued on the feasibility of utilizing ground-water storage on the Oahe unit, James division, Missouri River Basin project; on the San Luis west side division of the Central Valley project, California; and on the Weber Basin project, Utah, and others.

International Stream Investigations

The Bureau of Reclamation participated in continuing engineering studies for use of the United States Section of the International Joint Commission in its consideration of the Waterton-Belly and Souris-Red Rivers references of January 1948 relating to international streams on the boundary between the United States and Canada.

Land Classification

Irrigability classification of lands began with the passage of the Reclamation Act of 1902 and has continued to increase in importance as reclamation irrigation projects have grown in size, complexity, and cost. In 1924, the Second Deficiency Act (Fact Finders' Act) charged the Secretary of the Interior with the responsibility of having the lands on each new project and new division of a project classified with respect to their capacity, under a proper agricultural program, to support a farm family and pay water charges. The act further authorized the Secretary to set definite construction charges against the different classes of land for the purpose of equitably apportioning the total construction costs so that all lands may bear the burden of such costs according to their productive value.

To further assure that these responsibilities would be carried out, the Department of the Interior Appropriation Act for the fiscal year ending June 30, 1953, contained the following provision:

> That no part of this or any other appropriation shall be available for the initiation of construction under the terms of reclamation law of any dam or reservoir or water supply, or any tunnel, canal, or conduit for water, or water-distribution system related to such dam or reservoir until the Secretary shall certify to the Congress that an adequate soil survey and land classification has been made and that the lands to be irrigated are susceptible to the production of agricultural crops by means of irrigation.

During the 1953 fiscal year certifications were made for land-classification surveys completed on 27 projects, units, and divisions. These 27 land-classification surveys covered about 3,900,000 acres of land in 14 of the 17 Western States. About 2,300,000 acres of this land were found suitable for irrigation development but were not necessarily all included in plans for development.

Definite Plan Reports

Definite plan reports were prepared, reviewed, and approved for the following projects or units in fiscal year 1953:

Cachuma project, California
Central Valley project, California, American River division, Sly Park unit
Grants Pass project, Oregon, Savage Rapids Dam rehabilitation
Middle Rio Grande project, New Mexico, channel rectification, initial stage
Minidoka project, Idaho, North Side pumping division
Missouri River Basin project:
    Crow Creek pump unit (Three Forks division), Montana
    Glendo unit (Oregon Trail division), Wyoming
    Kirwin unit (Solomon division), Kansas
    Lower Marias unit (Marias division), Montana[1]
    Missouri diversion unit (Missouri-Souris division), Montana[1]
    Rapid Valley unit (Cheyenne division), South Dakota[1]
    Sargent unit (Middle Loup division), first stage, Nebraska
    Seven Sisters unit (Yellowstone division), Montana[2]
    Webster unit (Solomon division), Kansas[1]
Provo River project, Utah, Deer Creek division, Deer Creek powerplant
San Luis Valley project, Colorado, Conejos division, Platoro unit
Solano project, California
Vermejo project, New Mexico
Weber Basin project, Utah
Yakima project, Washington, Kennewick division

PROGRAMS AND FINANCE

The Accounting System

Work continued on additions to and refinements of the accounting system which were in process prior to the beginning of the fiscal year 1953. In addition, numerous revisions of the finance manual were made.

As a result of the refinements in the new accounting system, it was possible for the first time in the 50-year history of the Bureau to prepare a consolidated commercial or utility type of financial repor This report, 50 Years of Reclamation, was prepared early in th fiscal year 1953 and presented the financial status of the Bureau an the financial results for the past 50 years of its vast operations, comprising large construction, power, irrigation, and multipurpose activities. The report revealed, in true corporate style, the results obtaine with an expenditure of $2½ billion of public funds. It showed tha over $2 billion has been converted into physical plant which i bringing in a supply of lifegiving irrigation water to over 6 millio acres of fertile arid lands of the West and that over 26 billion kilowatt hours of electric energy is being generated annually for the benefi of the individual and industry alike; it shows that over $460,000,00 of the amount expended has been recovered and that repayment contracts for an additional $529 million of unmatured balances are i effect. In addition the report indicates that the Bureau is currentl collecting approximately $43 million per year in power revenues. I shows conclusively that all amounts expended will ultimately b recovered.

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[1] Approved for construction of dam and reservoir. Additional studies required for irrigation features.

[2] Report approved but unit, being infeasible under present conditions, is not proposed for construction.

Records Retention and Disposal

Aggressive action has been taken in connection with records disposal. The magnitude of the program becomes apparent only upon thorough study of the numerous problems pertaining to the disposition of records which have accumulated during a period of over half a century, which are stored in over 150 locations, the retention and disposal of which must conform to regulations and final approval of other authorities such as the Federal Power Commission, the General Accounting Office, the General Services Administration, and the Congress. These records consist of old discontinued forms which have been superseded by other forms that in turn were superseded and revised. Before disposition can be effected it will be necessary to sort and classify all forms and documents. Documents that are to be retained must be cataloged, arranged in proper order, transferred to a central location for permanent storage and be available for ready reference.

Review of Audit Reports

During the fiscal year 1953 the Systems and Procedures Branch reviewed about 75 audit reports made by the representatives of the Office of the Comptroller and the General Accounting Office. Necessary remedial actions were taken to correct specific deficiencies disclosed as a result of the audits.

Special Assignments

Typical of the special assignments performed by the Systems and Procedures Branch was the completion of preliminary cost allocations of the All-American Canal for use in repayment negotiations with the water users and other interested parties. The cost analysis covered a period of some 20 years of construction.

It is contemplated that during the early months of the fiscal year 1954 the basic elements of the new accounting system will have been perfected to the point that it can be printed in bound form comparable to those issued by regulatory agencies, such as the Federal Power Commission and the Interstate Commerce Commission. This will make available, in convenient and condensed form, much needed accounting and descriptive information for use of the construction engineers, operation and maintenance administrators and other interested officials and personnel.

Programs

Installation of the new accounting system in 1950 was accompanied by revision of the programing and scheduling techniques of the Bureau. Integration of the estimating, programing, reporting, and accounting procedures was also improved, so that by the end of the fiscal year a workable system, by which it was possible to follow the entire history of a project or feature from estimating through scheduling, reporting, and accounting, was in operation.

Progress was made in the technique of revising approved programs to meet changing conditions. This currently revised schedule proved to be an excellent source of readily available information for the answering of congressional and other inquiries during the year.

Aside from minor adjustments and improvements, the programing of construction and rehabilitation activities of the Bureau is in effective operating condition. Recognition of the workability of the construction and rehabilitation scheduling procedures was signified during the year by the adoption by the Bureau of the Budget for use in other Government construction agencies of the basic techniques developed in the Bureau of Reclamation.

TABLE 11.—Schedule of public works construction programs

Name and location of project	Total estimated obligations	Obligations		Estimated obligations							Balance to complete and projects not scheduled
		To June 30, 1952	1953	1954	1955	1956	1957	1958	1959	1960	
1. AUTHORIZED PROJECTS											
A. 63 completed projects and divisions	$301,472,492	$301,354,830	$115,235	$2,427							
B. Continuing divisions or projects:											
All-American Canal, Ariz.-Calif	69,705,353	62,282,466	1,694,918	250,000	$277,000	$10,000	$10,000	$10,000	$10,000	$10,000	$5,150,969
Avondale, Idaho	222,000			197,981	24,019						
Boise-Arrowrock Dam, Idaho	232,000	29,751	130,499	71,750							
Boulder Canyon, Hoover Dam and powerplant, Ariz.-Nev	164,490,000	158,476,009	350,329	350,000	1,206,000	3,529,000	578,662				
Cachuma, Calif	39,675,400	21,714,118	8,536,651	5,881,105	3,300,000	33,526	35,000	35,000	35,000	35,000	70,000
Central Valley, Calif	831,069,571	383,504,038	24,590,622	17,570,494	30,700,184	28,314,622	41,992,913	73,820,000	77,598,105	51,866,837	101,111,576
Colorado-Big Thompson, Colo	164,106,734	132,636,364	18,092,562	4,212,000	1,930,000	1,600,000	964,000	150,000			4,521,808
Colorado River front work and levee system, Ariz.-Calif.-Nev	9,730,582	8,636,066	794,516	300,000							
Columbia Basin, Wash	746,056,000	434,747,816	20,512,936	18,521,706	15,308,000	13,300,000	14,900,000	10,400,000	9,700,000	12,200,000	196,465,542
Dalton Gardens, Idaho	268,000			239,234	28,766						
Davis Dam, Ariz.-Nev	118,626,286	106,682,653	3,599,279	3,069,176	2,787,000	2,185,266	302,912				
Drainage and minor completion program	138,039,445	129,090,891	2,169,896	1,207,905	1,684,152	833,315	420,955	49,000			2,583,331
Eden, Wyo	7,242,794	3,642,065	344,742	614,506	1,154,000	977,794	509,687				
Eklutna, Alaska	32,950,000	6,842,561	12,650,292	7,750,000	4,512,000	1,195,147					
Fort Peck, Mont	23,194,049	9,155,240	388,809	477,000	475,000	928,000	4,015,000	2,990,000	1,133,000	640,000	2,992,000
Gila, Ariz	54,207,942	33,243,575	6,605,927	4,344,440	4,828,000	4,422,000	200,000	200,000	250,000	14,000	100,000
Hungry Horse, Mont	102,701,754	90,190,352	11,906,833	604,569							
Kendrick, Wyo	33,875,390	25,507,749	3,697,008	2,668,010	780,000	563,581	180,870	159,718	150,000	126,787	41,667
Kern River, Calif	110,586	67,133	23,453	20,000							
Kings River, Calif	181,301	175,222	1,755	4,324							
Klamath, Calif.-Oreg	20,485,466	14,196,193	491,036	105,000	920,000	895,000	200,000				3,678,237
Middle Rio Grande, N. Mex	28,848,759	949,371	1,995,816	1,431,144	2,630,000	11,340,404	3,946,400	847,000	190,000	1,990,000	3,528,624
Minidoka-North Side pumping, Idaho	10,514,000	877,458	176,803	959,406	1,906,046	2,641,633	1,899,828	127,500	93,466	9,944	1,821,916
Missouri River Basin, various	794,721,959	214,936,832	38,909,771	47,041,411	50,483,215	75,132,340	79,761,844	72,488,429	45,901,859	31,491,742	138,574,516
Palisades, Idaho-Wyo	76,300,000	5,305,291	9,922,183	15,810,432	14,810,865	14,858,647	8,595,913	5,060,783	1,935,886		
Paonia, Colo	6,710,249	1,855,868	104,274	75,200	10,000	132,916	1,711,159	1,595,588	1,225,244		
Provo River, Utah	32,697,260	29,656,712	1,833,799	216,749							990,000
Rehabilitation and betterment, various	25,179,622	7,359,412	2,131,132	1,581,830	2,500,542	2,356,706	2,000,000	2,000,000	2,000,000	2,000,000	1,250,000
Rio Grande, Elephant Butte power, N. Mex.-Tex	16,380,749	15,400,459	96,032	523,721	169,244						191,293
Riverton, Wyo	29,897,000	19,007,515	610,989	471,618	427,500	3,160,000	2,648,000	1,671,000	980,000	820,000	100,378
San Diego, Calif	16,362,579	25,563	15,773,275	377,660	186,081						

[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5,290,000	4,469,288	2,463,000	
Vermejo, N. Mex.	2,817,037	35,594	649,491	1,326,819	558,133						247,000
Weber Basin, Utah	68,670,000		1,302,538	5,188,696	10,160,000	11,719,500	9,843,677	10,059,000	7,602,000	4,566,000	8,228,589
Yakima-Kennewick, Wash.	12,566,200		1,499,245	3,473,803	4,433,093	3,160,059					
Yakima-Roza, Wash.	21,984,150	18,522,127	10,618	78,718	577,938	1,694,871	983,083	116,795			
Yuma auxiliary, Ariz.	2,776,487	2,266,487			100,000	410,000					
Subtotals, continuing divisions or projects	3,750,184,391	1,937,018,951	192,306,644	149,156,407	171,782,778	198,848,633	180,846,381	187,069,813	153,273,848	108,233,310	471,647,626
C. New divisions or projects:											
Canadian River, Tex.	88,655,055			21,000	1,000,000	11,228,900	22,491,020	33,359,760	16,997,275	3,557,100	
Carlsbad-Alamogordo Dam, N. Mex.	1,471,000				300,000	1,171,000					
Collbran, Colo.	17,040,000			94,900	1,000,000	3,218,000	4,464,000	5,357,100	2,906,000		
Minidoka-American Falls power, Idaho	8,800,000	414,953	16,150	7,669	4,000		853,000	2,275,000	2,675,000	2,554,228	
Missouri River Basin, various	2,919,638,021	65,697,734	9,120,504	5,594,392	8,180,000	47,860,094	77,104,143	107,350,884	109,992,739	102,897,332	2,385,840,199
Subtotal, new divisions or projects	3,035,604,076	66,112,687	9,136,654	5,717,961	10,484,000	63,477,994	104,912,163	148,342,744	132,571,014	109,008,660	2,385,840,199
Total, authorized divisions and projects	7,087,260,959	2,304,486,468	201,558,533	154,876,795	182,266,778	262,326,627	285,758,544	335,412,557	285,844,862	217,241,970	2,857,487,825
Missouri River Basin											
A. Completed divisions and units: Kortes unit, Wyo.	14,623,961	14,609,510	14,451								
B. Continuing divisions and units:											
Bostwick division, Nebr.-Kans.	52,790,684	9,996,664	3,396,625	4,183,571	5,058,714	7,590,555	7,852,000	6,603,396	4,590,555	1,394,760	2,123,844
Buford-Trenton unit, N. Dak.	300,000			113,000	187,000						
Canyon Ferry unit, Mont.	28,903,258	21,640,965	6,100,293	866,000	155,000	61,000	79,000	1,000			
Cedar Bluff unit, Kans.	18,231,450	13,575,000	150,623	30,000	35,000	100,000	535,000	1,648,000	1,068,338	27,963	1,061,526
Crow Creek pump unit, Mont.	1,773,910	152,634	719,276	587,000	236,000	42,000	21,000	16,000			
Frenchman-Cambridge division, Nebr.	73,318,453	42,322,686	3,461,478	3,966,125	2,309,651	3,232,882	3,368,477	3,674,207	2,864,801	710,575	7,407,571
Heart Butte unit, N. Dak.	6,100,000	3,887,112	35,851	330,000	152,000	338,000	788,000	532,000	35,237	1,800	
Jamestown unit, N. Dak.	5,070,000	850,351	2,246,812	1,440,300	303,000	102,000	60,000	20,000	31,000	16,537	
Kirwin unit, Kans.	20,027,619	1,365,405	3,566,900	5,674,000	4,102,000	3,493,253	954,253	265,738	10,802		595,268
Lower Marias unit, Mont.	67,551,987	2,446,191	2,596,892	5,748,904	9,052,000	13,064,000	10,497,000	5,760,000	2,913,000	3,635,000	11,839,000
Missouri diversion unit, Mont.	61,983,000	1,570,407	966,788	1,746,000	2,454,000	6,355,000	7,145,000	7,625,000	8,810,000	7,566,000	17,744,805
Rapid Valley unit, S. Dak.	9,683,307	434,809	1,095,391	3,693,000	2,358,000	975,000	893,000	178,000	28,000	20,107	8,000
St. Francis unit, Colo.-Kans.	15,433,129	13,162,659	25,569	40,000	15,000	50,000	367,700	1,035,928	472,443		263,830
Shadehill unit, S. Dak.	11,657,000	7,410,966	40,399	45,000	18,000	22,000	526,000	209,000	18,000	19,000	3,348,635
Transmission division, various	342,017,017	45,031,998	11,109,812	13,597,715	15,586,450	33,540,710	44,777,414	42,941,000	24,323,572	18,073,000	93,035,346
Webster unit, Kans.	24,351,807		1,499,500	4,365,000	8,216,000	5,706,940	1,627,000	1,748,660	659,111	12,000	517,596
Drainage and minor completon program	55,529,338	51,088,985	1,897,562	615,796	245,400	459,000	271,000	230,500	77,000	15,000	629,095
Subtotals, continuing divisions and units	794,721,959	214,936,832	38,909,771	47,041,411	50,483,215	75,132,340	79,761,844	72,488,429	45,901,859	31,491,742	138,574,516

TABLE 11.—Schedule of public works construction programs—Continued

Name and location of project	Total estimated obligations	Obligations		Estimated obligations							Balance to complete and projects not scheduled
		To June 30, 1952	1953	1954	1955	1956	1957	1958	1959	1960	
C. New divisions and units:											
Ainsworth unit, Nebr	$25,394,186	--------	$159,095	$150,000	$1,000,000	$4,850,000	$7,558,000	$8,496,000	$3,181,091		
Bluff unit, Wyo	777,000	$29,258	14,286	5,000	157,000	340,000	183,000	23,000	25,456	--------	--------
Glendo unit, Wyo	50,859,000	670,590	--------	176,700	2,000,000	14,500,000	13,756,000	12,250,000	7,511,710	--------	--------
Hanover unit, Wyo	2,594,000	131,345	17,905	5,000	300,000	1,030,000	830,000	173,000	106,750	--------	--------
Helena Valley unit, Mont	11,988,669	242,865	25,804	10,000	273,000	2,299,000	4,466,000	3,250,000	1,168,000	$43,000	$211,000
Nickwall unit, Mont	885,000	46,613	4,691	3,000	321,000	423,000	2,000	2,000	15,000	25,000	42,696
Owl Creek unit, Wyo	3,442,000	712,589	10,527	--------	311,000	1,156,000	1,035,000	216,884	--------	--------	--------
Sargent unit, Nebr	15,681,786	576,456	282,652	45,000	1,000,000	4,194,256	1,843,143	--------	--------	--------	7,740,279
Shoshone extensions unit, Wyo	45,552,906	1,071,810	156,086	30,000	818,000	6,417,000	6,108,000	6,383,000	5,911,000	3,801,000	14,857,010
Yellowtail unit, Mont	115,122,000	2,094,878	179,129	--------	2,000,000	7,800,000	17,474,000	31,054,000	32,550,000	18,856,000	3,113,993
Remaining divisions and units	2,609,175,753	29,794,063	3,499,630	2,101,937	--------	4,850,838	23,855,000	45,503,000	59,523,732	80,172,332	2,359,875,221
Other department agencies	38,165,721	30,327,267	4,770,699	3,067,755	--------	--------	--------	--------	--------	--------	--------
Subtotals, new divisions and units	2,919,638,021	65,697,734	9,120,504	5,594,392	8,180,000	47,860,094	77,104,143	107,350,884	109,992.739	102,897,332	2,385,840,199
Grand totals, Missouri River Basin	3,728,983,941	295,244,076	48,044,726	52,635,803	58,663,215	122,992,434	156,865,987	179,839,313	155,894,598	134,389,074	2,524,414,715
Drainage and minor completion program											
Boise, Anderson Ranch, Idaho	30,174,931	30,025,712	84,219	65,000	--------						
Boise drainage, Idaho	85,630	36,582	200	2,000	2,800	--------	--------	--------	--------	--------	44,048
Boise-Payette, Idaho	17,074,000	16,776,561	43,124	100,000	50,000	104,315	--------	--------	--------	--------	--------
Buffalo Rapids, first division, Mont	2,460,513	1,918,517	172,996	70,000	121,000	100,000	78,000	--------	--------	--------	--------
Buffalo Rapids, second division, Mont	2,134,593	1,645,051	73,542	90,000	80,000	106,000	140,000	--------	--------	--------	--------
Deschutes-North unit, Oregon	11,280,252	10,412,350	63,138	15,400	55,000	--------	--------	--------	--------	--------	734,364
Grants Pass, Savage Rapids Dam, Oreg	700,000	--------	532,178	71,470	96,352	--------	--------	--------	--------	--------	--------
Mancos, Colo	4,229,132	3,879,132	--------	5,000	345,000	--------	--------	--------	--------	--------	--------
Milk River, Fresno Dam, Mont	2,008,837	1,835,074	9,395	142,368	22,000	--------	--------	--------	--------	--------	--------
Minidoka, Gooding, Idaho	6,676,186	6,602,379	3,216	2,000	--------	--------	--------	--------	--------	--------	68,591
Mirage Flats, Nebr	3,308,647	3,248,618	362	59,667	--------	--------	--------	--------	--------	--------	--------
Pine River, Colo	3,341,388	3,291,388	--------	25,000	25,000	--------	--------	--------	--------	--------	--------
San Luis Valley, Platoro unit, Colo	3,852,415	3,706,336	131,079	15,000	--------	--------	--------	--------	--------	--------	--------
Shoshone, Wyo	24,000,000	20,409,853	666,819	130,000	460,000	398,000	150,000	49,000	--------	--------	1,736,328
Sun River, Greenfields, Mont	9,925,769	9,550,240	38,574	34,000	125,000	125,000	52,955	--------	--------	--------	--------
Tucumcari, N. Mex	16,787,152	15,753,098	351,054	381,000	302,000	--------	--------	--------	--------	--------	--------
Total	138,039,445	129,090,891	2,169,896	1,207,905	1,684,152	833,315	420,955	49,000	--------	--------	2,583,331

Missouri River Basin:											
Angostura unit, S. Dak	13,676,330	11,808,329	1,102,001	79,000	66,000	95,000	50,000	44,000	73,000	11,000	348,000
Boysen unit, Wyo	34,069,000	32,728,318	551,296	112,994	137,000	224,000	150,000	133,000	----	----	32,392
Dickinson unit, N. Dak	1,726,700	1,323,000	2,497	21,000	1,000	50,000	50,000	30,500	----	----	248,703
Fort Clark unit, N. Dak	731,409	526,693	129,316	43,000	18,400	2,000	----	4,000	4,000	4,000	
Keyhole unit, Wyo	4,820,268	4,228,431	111,535	357,302	23,000	60,000	21,000	19,000	----	----	----
Savage unit, Mont	505,631	474,214	917	2,500	----	28,000	----	----	----	----	----
Total	55,529,338	51,088,985	1,897,562	615,796	245,400	459,000	271,000	230,500	77,000	15,000	629,095
Rehabilitation and betterment of existing projects											
Belle Fourche, S. Dak	690,193	366,945	6,742	3,600	----	312,906	----	----	----	----	----
Bitter Root, Mont	89,337	37,020	217	8,100	44,000	----	----	----	----	----	----
Boise, Black Canyon Dam, Idaho	992,667	498,723	----	34,298	459,646	----	----	----	----	----	----
Humboldt, Nev	118,000	----	----	----	118,000	----	----	----	----	----	----
Klamath, Oreg.-Calif	65,000	----	----	58,500	6,500	----	----	----	----	----	----
Milk River, Mont	863,076	349,905	162,552	171,632	178,987	----	----	----	----	----	----
North Platte, Nebr.-Wyo	3,660,000	1,507,270	584,383	450,000	593,548	524,799	----	----	----	----	----
Riverton, Wyo	1,950,000	1,463,420	219,450	64,700	202,430	----	----	----	----	----	----
Salt River, Ariz	6,000,000	2,734,765	1,000,234	674,000	822,000	769,001	----	----	----	----	----
Shoshone, Wyo	690,000	367,640	154,929	117,000	50,431	----	----	----	----	----	----
Sun River, Fort Shaw, Mont	36,349	33,724	2,625	----	----	----	----	----	----	----	----
Umatilla, Oreg	25,000	----	----	----	25,000	----	----	----	----	----	----
Additional projects	10,000,000	----	----	----	----	750,000	2,000,000	2,000,000	2,000,000	2,000,000	1,250,000
Total	25,179,622	7,359,412	2,131,132	1,581,830	2,500,542	2,356,706	2,000,000	2,000,000	2,000,000	2,000,000	1,250,000
Total, authorized divisions and projects	7,087,260,959	2,304,486,468	201,558,533	154,876,795	182,266,778	262,326,627	285,758,544	335,412,557	285,844,862	217,241,970	2,857,487,825

TABLE 12.—Schedule of irrigation and power development

Name and location of project	Schedule of power development—kilowatts (in thousands)												Schedule of irrigation development—acres (in thousands)										
	Existing June 30, 1952	Actual 1953	1954	1955	1956	1957	1958	1959	1960	Estimated additional	Total	Type	Existing June 30, 1952	Actual 1953	1954	1955	1956	1957	1958	1959	1960	Estimated additional	Total
1. AUTHORIZED PROJECTS																							
A. 63 Completed projects and divisions	218.4										218.4	F	2,092.9										2,092.9
												S	1,822.6										1,822.6
B. Continuing divisions or projects:																							
All-American Canal, Ariz.-Calif.	24.4		9.6								34.0	F	463.4	9.6	3.1							11.3	487.4
												S	22.2	1.5									23.7
Avondale, Idaho												F											
												S				0.9							0.9
Boise-Arrowrock Dam, Idaho												F											
												S											
Boulder Canyon, Hoover Dam and power plant, Ariz.-Nev.	1.167.3	82.5				104.5					1,354.3	F											
												S											
Cachuma, Calif.												F					0.5						0.5
												S					26.4						26.4
Central Valley, Calif.	454.0			175.5				143.0	75.0	400.0	1,247.5	F	9.1		3.8	4.1	3.6	42.1	3.5	162.2	1.4	25.1	254.9
												S	533.1	44.2	8.1	30.2	58.2	39.3	68.7	65.9	0.3	2.6	850.6
Colorado-Big Thompson, Colo.	74.7		104.8				6.7				186.2	F											
												S	230.0	58.0	122.0	100.0	105.0						615.0
Colorado River front work and levee system, Ariz.-Calif.-Nev.												F											
												S											
Columbia Basin, Wash.	1,974.0										1,974.0	F	73.0	58.0	55.0	61.0	37.0	43.0	39.0	40.0	34.0	589.0	1,029.0
												S											
Dalton Gardens, Idaho												F											
												S				0.9							0.9
Davis Dam, Ariz-Nev.	225.0										225.0	F											
												S											
Drainage and minor completion program	39.1										39.1	F	385.4	2.1		1.0		5.6				42.0	436.1
												S	542.7	0.5		10.3							553.5
Eden, Wyo.												F				4.5	9.0	6.7					20.2
												S											
Eklutna, Alaska				30.0							30.0	F											
												S											
Fort Peck, Mont.												F											
												S											
Gila, Ariz.												F	21.8	22.3	17.9	21.3	8.0	11.7				12.0	115.0
												S											
Hungry Horse, Mont.		142.5	142.5								285.0	F											
												S											
Kendrick, Wyo.	32.4			36.0							68.4	F	9.5	1.9	1.0	1.0	2.0	2.0	2.0	0.6			20.0
												S											

Kern River, Calif												F											
												S											
Kings River, Calif												F											
												S											
Klamath, Calif-Oreg												F	209.1									37.7	246.8
												S											
Middle Rio Grande, N. Mex												F											
												S					45.0	58.0	18.7				121.7
Minidoka-North Side pumping, Idaho												F	5.1	2.2	9.1	10.1	10.9	32.1					69.5
												S											
Missouri River Basin, various	1.2	15.0	50.0			2.0				19.6	87.8	F	9.8	12.2	22.4	17.2	17.9	27.7	66.1	66.8	23.5	188.8	452.4
												S		2.7				8.9	10.0	0.5		0.9	23.0
Palisades, Idaho-Wyo							114.0				114.0	F											
												S							650.0				650.0
Paonia, Colo												F	1.0					1.2					2.2
												S	11.4	0.9				0.5		2.0			14.8
Provo River, Utah										5.0	5.0	F											
												S	46.6	10.0									56.6
Rehabilitation and betterment, various												F											
												S											
Rio Grande, Elephant Butte power, New Mexico-Texas	24.3										24.3	F											
												S											
Riverton, Wyo	1.6										1.6	F	58.4					5.9	4.0	4.7	3.9	2.5	79.4
												S											
San Diego, Calif												F											
												S											
Solano, Calif												F											
												S					21.8	33.2	41.1				96.1
Vermejo, N. Mex												F				7.4							7.4
												S											
Weber Basin, Utah						4.0	1.4				5.4	F							5.0	9.0		36.5	50.5
												S						2.0	3.0	6.0		13.4	24.4
Yakima-Kennewick, Wash					12.0						12.0	F					14.5						14.5
												S					4.6						4.6
Yakima-Roza, Wash							11.3				11.3	F	72.0										72.0
												S											
Yuma auxiliary, Ariz												F	2.3			1.0							3.3
												S											
Subtotals, continuing divisions or projects	4,018.0	240.0	306.9	241.5	12.0	110.5	133.4	143.0	75.0	424.6	5,704.9	F	1,319.9	108.3	112.3	128.6	103.4	178.0	119.6	283.3	62.8	944.9	3,361.1
												S	1,386.0	117.8	130.1	142.3	261.0	141.9	791.5	74.4	.3	16.9	3,062.2

TABLE 12.—Schedule of irrigation and power development—Continued

Name and location of project	Schedule of power development—kilowatts (in thousands)											Type	Schedule of irrigation development—acres (in thousands)										
	Existing June 30, 1952	Actual 1953	1954	1955	1956	1957	1958	1959	1960	Estimated additional	Total		Existing June 30, 1952	Actual 1953	1954	1955	1956	1957	1958	1959	1960	Estimated additional	Total
C. New divisions or projects:																							
Canadian River, Tex.												F											
												S											
Carlsbad-Alamogordo Dam, N. Mex.												F											
												S											
Collbran, Colo.							5.5	2.5			8.0	F							2.3				2.3
												S							18.3				18.3
Minidoka-American Falls power, Idaho									30.0		30.0	F											
												S											
Missouri River Basin, various								72.0	50.0	754.5	876.5	F					8.9	15.1	18.2	49.8	34.3	4,502.8	4,629.1
												S					4.4	13.6	3.0	41.6	2.7	1,009.5	1,074.8
Subtotals, new divisions or projects							5.5	74.5	80.0	754.5	914.5	F					8.9	15.1	20.5	49.8	34.3	4,502.8	4,631.4
												S					4.4	13.6	21.3	41.6	2.7	1,009.5	1,093.1
Total, authorized divisions and projects	4,236.4	240.0	306.9	241.5	12.0	110.5	138.9	217.5	155.0	1,179.1	6,837.8	F	3,412.8	108.3	112.3	128.6	112.3	193.1	140.1	333.1	97.1	5,447.7	10,085.4
												S	3,208.6	117.8	130.1	142.3	265.4	155.5	812.8	116.0	3.0	1,026.4	5,977.9
Missouri River Basin																							
A. Completed divisions and units:																							
Kortes unit, Wyo.	36.0										36.0	F											
B. Continuing divisions and units:												S											
Bostwick division, Neb.-Kan.												F	7.5	1.9	1.7	4.3	13.9	7.1	23.0	19.7	6.5	0.6	86.2
												S											
Buford-Trenton unit, N. Dak.												F											
												S											
Canyon Ferry unit, Mont.			50.0								50.0	F											
												S											
Cedar Bluff unit, Kan.												F								11.5			11.5
												S											
Crow Creek pump unit, Mont.												F			5.0								5.0
												S											
Frenchman-Cambridge division, Neb.												F		6.0	5.3	9.9	0.6	6.1	10.8	8.3		8.0	55.0
												S		2.7					10.0			0.9	13.6
Heart Butte unit, North Dak.												F	0.1			2.9		4.8	5.3				13.1
												S											
Jamestown unit, N. Dak.												S											
												F											

Kirwin unit, Kan.												F					3.4	4.5	3.6				11.5
												S											
Lower Marias unit, Mont.						2.0				1.6	3.6	F							12.0	12.0	12.0	91.0	127.0
												S											
Missouri diversion unit, Mont.										18.0	18.0	F						5.2	4.9	5.0	5.0	79.9	100.0
												S											
Rapid Valley unit, S. Dak.												F							2.2				2.2
												S						8.9					8.9
St. Francis unit, Colo.-Kan.												F								6.0			6.0
												S								0.5			0.5
Shadehill unit, S. Dak.												F										9.0	9.0
												S											
Transmission division, various												F											
												S											
Webster unit, Kan.												F							4.2	4.3			8.5
												S											
Drainage and minor completion program	1.2	15.0									16.2	F	2.2	4.3	10.4	0.1			0.1			0.3	17.4
												S											
Subtotals, continuing divisions and units	1.2	15.0	50.0			2.0				19.6	87.8	F	9.8	12 2	22.4	17.2	17.9	27.7	66.1	66.8	23.5	188.8	452.4
												S		2.7				8.9	10.0	0.5		0.9	23.0
C. New divisions and units:																							
Ainsworth unit, Neb.												F								44.8			44.8
												S											
Bluff unit, Wyo.												F						1.2					1.2
												S											
Glendo unit, Wyo.								72.0			72.0	F											
												S								40.0			40.0
Hanover unit, Wyo.												F						6.2					6.2
												S											
Helena Valley unit, Mont.												F							8.0	5 0			13.0
												S							3.0	1.6			4.6
Nickwall unit, Mont.												F					2.8						2.8
												S											
Owl Creek unit, Wyo.												F											
												S					4.4	13.6					18.0
Sargent unit, Neb.										4.4	4.4	F					6.1	7.7				3.8	17.6
												S											
Shoshone extensions unit, Wyo.												F							10.2		11.4	43.7	65.3
												S										3.8	3.8
Yellowtail unit, Mont.									50.0	150.0	200.0	F											
												S											
Remaining divisions and units										600.1	600.1	F									22.9	4,455.3	4,478.2
												S									2.7	1,005.7	1,008.4
Subtotals, new divisions and units								72.0	50.0	754.5	876.5	F					8.9	15.1	18.2	49.8	34.3	4,502.8	4,629.1
												S					4.4	13.6	3.0	41.6	2.7	1,009.5	1,074.8
Grand total, Missouri River Basin	37.2	15.0	50.0			2.0		72.0	50.0	774.1	1,000.3	F	9.8	12.2	22.4	17.2	26.8	42.8	84.3	116.6	57.8	4,691.6	5,081.5
												S		2.7			4.4	22.5	13.0	42.1	2.7	1,010.4	1,097.8

TABLE 12.—Schedule of irrigation and power development—Continued

Name and location of project	Schedule of power development—kilowatts (in thousands)											Schedule of irrigation development—acres (in thousands)											
	Existing June 30, 1952	Actual 1953	1954	1955	1956	1957	1958	1959	1960	Estimated additional	Total	Type	Existing June 30, 1952	Actual 1953	1954	1955	1956	1957	1958	1959	1960	Estimated additional	Total
Drainage and minor completion program																							
Boise-Anderson Ranch, Idaho	27.0										27.0	F											
												S	300.0										300.0
Boise drainage, Idaho												F											
												S											
Boise-Payette, Idaho												F	51.8										51.8
												S											
Buffalo Rapids, first division, Mont												F	15.7										15.7
												S											
Buffalo Rapids, second division, Mont												F	11.6										11.6
												S											
Deschutes-North unit, Oreg	1.5										1.5	F	50.0										50.0
												S	49.2										49.2
Grants Pass, Savage Rapids Dam, Oreg												F											
												S				10.3							10.3
Mancos, Colo												F		1.1									1.1
												S	7.4	.5									7.9
Milk River, Fresno Dam, Mont												F											
												S											
Minidoka, Gooding, Idaho												F	20.5										20.5
												S	78.2										78.2
Mirage Flats, Nebr												F	12.0										12.0
												S											
Pine River, Colo												F						5.6				29.4	35.0
												S	34.0										34.0
San Luis Valley, Platoro unit, Colo												F											
												S	73.9										73.9
Shoshone, Wyo	10.6										10.6	F	98.6	.7		1.0						11.2	111.5
												S											
Sun River, Greenfields, Mont												F	83.0	.3								1.4	84.7
												S											
Tucumcari, N. Mex												F	42.2										42.2
												S											
Total	39.1										39.1	F	385.4	2.1		1.0		5.6				42.0	436.1
												S	542.7	.5		10.3							553.5

Missouri River Basin:																							
Angostura unit, S. Dak	1.2										1.2	F		4.0	8.2								12.2
												S											
Boysen unit, Wyo		15.0									15.0	F											
												S											
Dickinson unit, N. Dak												F		.3	.1	.1			.1			.3	.9
												S											
Fort Clark unit, N. Dak												F			2.1								2.1
												S											
Keyhole unit, Wyo												F											
												S											
Savage unit, Mont												F	2.2										2.2
												S											
Total	1.2	15.0									16.2	F	2.2	4.3	10.4	.1			.1			.3	17.4
												S											

Budget

Appropriations made available to the Bureau of Reclamation for fiscal year 1953 amounted to $206,447,991, a decrease of $27,960,531 under fiscal year 1952. With an unobligated balance of $50,897,132 including reimbursements from the previous year and working funds advanced from other governmental agencies totaling $16,782,491, the money available for reclamation totaled $274,127,614. Of this amount unobligated funds at the end of fiscal year 1953 amounted to $46,181,549.

Obligations for fiscal year 1953 totaled $227.9 million or 83.2 percent of the obligations programed for fiscal year 1953, as compared with 86.5 percent of the program accomplished in 1952. The total obligations referred to include $16.6 million of obligated working funds. While program accomplishment was slightly improved over the previous year, during fiscal year 1953 certain factors such as delays in executing repayment contracts, floods in some areas, continued shortages of certain types of heavy electrical equipment, labor unrest resulting in strikes in some industries upon which the Bureau depends for materials and equipment, and the limitation as in 1952, on the number of personnel and the amount that could be expended for personal services all had a bearing on the amount of money unobligated at the end of the fiscal year. A provision in the 1953 appropriation bill requiring the Secretary to certify to the Congress that an adequate soil survey and land classification has been made as a condition precedent to initiation of construction, caused some delay in the construction program and further increased the unobligated balance.

The 1953 appropriation act as in previous years imposed certain restrictions upon the Bureau. As in the 1952 act the Bureau was again prohibited from initiating construction on transmission facilities in areas covered by power wheeling contracts unless the power companies in such areas were unable or unwilling to construct them. The limitation on the amount of money which may be used for the performance of work by Government forces (force account work) first imposed upon the Bureau in the 1949 appropriation act and repeated each year since was included again in the 1953 act. This limitation provided that not to exceed 12 percent of the allotment for any one project with a maximum of $225,000 may be used on any one project or unit of the Missouri River Basin. Again as in the previous year a limitation of $150,000 was placed on the amount of money that could be expended for information work.

The amounts appropriated by activity for fiscal year 1953, together with the amounts to be derived from the special and general funds follow:

TABLE 13.—Condensed statement of appropriations, fiscal year 1953, exclusive of trust funds

	Amount appropriated
General investigations	$4,000,000
Reclamation fund	(3,200,000)
Colorado River Dam fund: Colorado River development fund	(500,000)
General fund	(300,000)
Construction and rehabilitation	177,797,991
Reclamation fund	(49,155,000)
General fund	(128,642,991)
Operation and maintenance	19,000,000
Reclamation fund	(14,940,450)
Colorado River Dam fund	(2,143,000)
General fund	(1,916,550)
General administrative expenses	5,250,000
Reclamation fund	(5,250,000)
Emergency fund	400,000
Reclamation fund	(400,000)
Grand total	206,447,991
Reclamation fund	(72,945,450)
Colorado River Dam fund	(2,643,000)
General fund	(130,859,541)

Reports

The regular recurring reports activities for fiscal year 1953 centered around central statistical services, progress analyses, and special reports and periodicals.

Central statistical services collected, developed, compiled, and furnished various statistical data for administrative purposes and for replies to inquiries from numerous sources; maintained operating financial and personnel statistics on a current basis; cleared statistical data contained in Bureau releases; operated the Bureau's summary cost and progress reports system; furnished monthly estimates of year-end carryover funds; provided technical supervision for the Bureau's personnel roster; controlled personnel and personal services limitations; prepared pertinent Bureau manual procedures, and compiled related Bureau reports.

During the year arrangements were made for participation by regional representatives in the reviews of field-submitted reports, particularly the Bureau's summary cost and progress report, with an objective of improving field preparation of manual-prescribed reports and their application to administrative uses.

Progress-analysis work provided management monthly with operating statistics in the form of the Bureau's activities digest report, program briefs, summary progress analysis, Commissioner's display charts, and "progress" report, covering all activities. As a byproduct of available photo prints, the Bureau's photo-album routine was established whereby progress photographs of important construction work and newsworthy events are circularized monthly among interested officials. Summaries and analyses of the Bureau's monthly administrative and general expenses report inaugurated at the close of last year was continued and supplemented with detailed reports which served as the basis for determinations leading to adjustments in the Bureau's organization and reduction in employment in line with recent and projected trends toward curtailed annual programs.

Special reports work involved the biweekly Washington report, the monthly programs and finance report, the annual Federal Power Commission No. 1 reports, the annual consolidated operating statement of Bureau of Reclamation power system, and the annual report of the Commissioner for inclusion in the annual report of the Secretary.

Under plans prepared late in the 1952 fiscal year, a special publication program was carried out as scheduled during fiscal year 1953. As a result, a selected group of the Bureau's useful publications used for basic data were brought up to date, making available those data for which there are constant demands. These ready references included (1) Supplement to Bureau of Reclamation Appropriation Acts and Allotments, which brought 1902–48 data, published in 1949, up through 1953 complete with data tables; (2) Supplement to Bureau of Reclamation Project Feasibilities and Authorizations, which likewise brought 1902–48 information published in 1949, up to 1953; (3) the statistical appendix to the Commissioner's annual report, which supplements that report furnishing tables of supplementary data; (4) the Reclamation Program, 1953–59, presenting the Bureau's projected program proposed for these years and superseding the previous edition covering the period 1948–54; (5) Repayment Histories and Payout Schedules, a new edition of How Reclamation Pays, published in 1947, which contains essential information on authorization, cost estimate, nonreimbursable and reimbursable costs with allocations, repayment contracts executed, payment schedules, and status of repayments for each Bureau project and Missouri River Basin unit, complete with a payout study for each multipurpose project.

TABLE 14.—Appropriations from reclamation and other funds, fiscal years 1902–53

Fiscal year	Reclamation fund		General fund		Colorado River Dam fund	Emergency relief funds [2]	Permanent appropriations	Total
	Regular [1]	Power revenue	Regular	Colorado River FW and LS				
1902	[3] $165, 000							(3)
1903	[3] 5, 950, 000							(3)
1904	[3] 18, 440, 000							[3] $2, 000, 000
1905	[3] 8, 758, 000							(3)
1906	[3] 27, 494, 961							[3] 15, 363, 800
1907	[3] [4] 43, 569, 161							(3)
1907	18, 176. 161							[3] 18, 051, 161
1908	9, 562, 038							9, 562, 038
1909	9, 180, 700							9, 180, 700
1910	8, 183. 300							8, 183. 300
1911	26, 896, 790							26, 896, 790
1912	8, 262. 367							8, 262, 367
1913	8, 300, 508							8, 300, 508
1914	15, 931, 922							15, 931, 922
1915	1. 261, 411							1, 261, 411
1916	13, 530, 000							13, 530, 000
1917	8, 887, 557		$15, 000					8, 902, 557
1918	8, 227, 000		310, 213					8, 537, 213
1919	9, 397, 081		443, 196					9, 840, 277
1920	7, 300, 000		548, 927					7, 848, 927
1921	8, 463, 000		661, 177					9, 124, 177
1922	20, 266, 000		335, 871					20, 601, 871
1923	14, 800, 000		559, 530					15, 359, 530
1924	13, 800. 000		314, 067					14, 114, 067
1925	11. 890. 809							11, 890, 809
1926	12 563, 240			$50, 000				12, 613, 240
1927	7. 436, 320		40, 000	35, 000				7, 511, 320
1928	12, 148, 800		15, 000	35, 000				12, 198, 800
1929	14, 138, 400	$190, 000	15, 000	100, 000				14, 443, 400
1930	8, 253, 000	390, 000	10, 660 000	100. 000				19. 403, 000
1931	9, 087. 000	395, 000		100, 000				9, 582, 000
1932	6, 971, 000	300. 000	25, 000, 000	100. 000				32. 371, 000
1933	2. 442, 288	375, 000	13, 050, 000					15, 867, 288
1934	3. 003, 000	405, 000	8, 000. 000	48, 000		$103, 535, 000		114, 991, 000
1935	860, 750	316, 000				34, 076, 000		35, 252, 750
1936	1, 022, 100	366, 000	15, 900, 000	50, 000		25, 438, 000		42, 776, 100
1937	12, 028, 600	316. 000	34, 850, 000		$350, 000	[4] 4, 873. 000		42, 671, 600
1938	11, 991, 600	331, 000	30, 655. 000	15, 000	500, 000	37, 047, 500	$1, 100, 000	81, 640, 100
1939	10, 574, 600	366, 000	32, 980, 000	15, 000	500, 000	[4] 2, 502, 488	4, 600. 000	46, 533, 112
1940	13. 269, 600	606, 000	64, 200, 000	15, 000	575, 000	28, 347	5, 700, 000	84, 393, 947
1941	9, 429, 600	571, 000	63, 750, 000	15, 000	768, 000	[4] 124, 300	6, 600, 000	81, 009, 300
1942	7, 446, 600	664, 400	94, 245, 031	50, 000	1, 000, 000	[4] 19, 961	2, 600, 000	105, 986, 070
1943	2, 651, 060	956, 900	86, 628, 565	47, 895	1, 379, 250	[4] 1, 131	2, 600. 000	94, 262, 539
1944	2, 422, 500	2, 091, 975	35, 578, 000	75, 000	1, 443, 100	[4] 72, 709	5, 669. 468	47, 207, 334
1945	5, 321, 000	2, 328, 800	17, 734, 200	340, 000	2, 200, 000	[4] 22, 332	5, 282, 501	33, 184, 169
1946	34, 089, 290	2, 528, 600	82, 858, 000	612, 500	2, 550, 000		4, 491, 718	127, 130, 108
1947	36, 315, 968	3, 284, 245	75, 931, 805	100, 000	1, 814, 330	[4] 30, 396	4, 806, 879	122, 222, 831
1948	20. 127, 250	5, 549, 500	115, 420, 288		2, 088. 000		5, 545, 400	148, 730, 438
1949	29, 952, 663	6, 999, 601	226, 801, 503		2, 450, 000		4, 693, 475	270, 897, 242
1950	35, 447, 705	9, 327, 097	311, 434, 175		2, 123, 100		8, 034, 825	366, 366, 902
1951	37, 660, 175	9, 257, 190	222, 453, 635		2, 308, 000		5, 650. 514	277, 329, 514
1952	42, 077, 837	9, 344, 510	180, 665, 175		2, 171, 000		6, 505, 000	240, 763, 522
1953	61, 783, 400	11, 162, 050	130, 859, 541		2, 643, 000		3, 632, 000	210, 079, 991
Total	690, 070, 790	68, 421, 868	1, 882, 912, 899	1, 903, 395	26, 862, 780	192, 478, 530	77, 511, 780	2, 940, 162, 042

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[1] Prior to fiscal year 1916 funds were made available from the reclamation fund by allotment authorized by the Secretary of the Interior.

[2] Emergency relief funds include allocations from NIRA, PWA, WPA, and ERA funds.

[3] Allotments made prior to Fallon, Nev., conference on July 27, 1907, were canceled and summary allotments issued. Original amounts excluded from total column.

[4] Credit.

TABLE 15.—The reclamation fund, 1952–54, funds available for appropriation

	Actual 1952	Actual 1953	Estimated 1954
Unappropriated balance brought forward (as of June 30)	$40, 828, 300	$74, 719, 171	$78, 234, 263
Less items in transit			994
Accretions and collections:			
Bureau of Reclamation, .100	11, 322, 621	16, 813, 339	13, 300, 000
Other agencies, .200	22, 952, 820	25, 118, 114	25, 960, 000
Reclamation fund, power revenues, .300	[1] 43, 453, 149	32, 166, 768	38, 200, 000
Total accretions and collections	77, 728, 590	74, 098, 221	77, 460, 000
Total available for appropriation	118, 556, 890	148, 817, 392	155, 693, 269
Less:			
Appropriated for refund of revenue collections	150, 000	225, 000	150, 000
Appropriated for Farmers irrigation district, North Platte project, Nebraska	10, 088	11, 965	10, 748
Add:			
Lapsed appropriations	5, 208, 981	2, 599, 286	1, 003, 000
Return of fiscal year 1951 appropriation, sec. 1214	2, 535, 735		
Deduct appropriation or estimate for—			
General investigations	3, 810, 000	3, 200, 000	2, 400, 000
Construction and rehabilitation	29, 257, 650	49, 155, 000	52, 509, 206
Operation and maintenance	12, 476, 494	14, 940, 450	15, 075, 290
General administrative expenses	5, 478, 203	5, 250, 000	4, 500, 000
Emergency fund	400, 000	400, 000	400, 000
Total appropriation or estimate	51, 422, 347	72, 945, 450	74, 884, 496
Balance carried forward	74, 719, 171	78, 234, 263	81, 651, 025

[1] Includes prior years power revenues, transferred from Bonneville to Columbia Basin in the amount of $12,175,926.

TABLE 16.—Accretions to reclamation fund, by States, fiscal year 1953

State or other accretions	Sale of public land		Proceeds from Oil Leasing Act		Total to June 30, 1953
	Fiscal year 1953	To June 30, 1953	Fiscal year 1953	To June 30, 1953	
Alabama	[1] $4, 372. 65		$1, 634. 63	$202, 608. 05	$202, 608. 05
Arizona	37, 964. 07	$2, 936, 949. 69	76, 568. 23	211, 916. 69	3, 148, 866. 38
Arkansas			1, 483. 77	4, 483. 15	4, 483. 15
California	270, 232. 15	9, 528, 183. 34	3, 961, 700. 89	51, 248, 340. 54	60, 776, 523. 88
Colorado	105, 626. 60	10, 745, 985. 29	3, 377, 087. 18	16, 651, 026. 48	27, 397, 011. 77
Florida			1, 716. 22	1, 857. 97	1, 857. 97
Idaho	162, 086. 12	7, 570, 115. 41	83, 002. 65	389, 341. 63	7, 959, 457. 04
Illinois				31. 50	31. 50
Kansas	1, 596. 52	1, 041, 529. 43	36, 172. 14	247, 265. 20	1, 288, 794. 63
Louisiana			38, 704. 65	485, 644. 82	485, 644. 82
Michigan			9, 214. 45	21, 260. 44	21, 260. 44
Mississippi			3, 551. 66	8, 125. 41	8, 125. 41
Montana	45, 828. 88	15, 740, 760. 54	1, 274, 795. 00	7, 238, 480. 91	22, 979, 241. 45
Nebraska	9, 399. 77	2, 167, 945. 41	37, 327. 36	45, 161. 22	2, 213, 106. 63
Nevada	12, 674. 52	1, 130, 502. 56	531, 980. 99	1, 235, 766. 22	2, 366, 268. 78
New Mexico	62, 343. 02	7, 019, 783. 48	3, 457, 362. 88	22, 421, 077. 96	29, 440, 861. 44
North Dakota	1, 646. 42	12, 264, 046. 41	78, 528. 80	541, 483. 73	12, 805, 530. 14
Oklahoma	2, 188. 24	5, 963, 189. 15	22, 109. 52	140, 718. 19	6, 103, 907. 34
Oregon	247, 362. 81	13, 442, 474. 22	22, 810. 06	40, 908. 14	13, 483, 382. 36
South Dakota	5, 925. 10	7, 759, 144. 85	147, 824. 94	261, 688. 22	8, 020, 833. 07
Utah	54, 011. 51	4, 644, 968. 60	1, 159, 302. 72	6, 140, 304. 78	10, 785, 273. 38
Washington	126, 111. 25	8, 184, 400. 52	5, 809. 16	57, 412. 82	8, 241, 813. 34
Wyoming	56, 714. 84	9, 201, 029. 86	8, 411, 794. 85	83, 164, 408. 70	92, 365, 438. 56
Total	1, 197, 339. 17	119, 341, 008. 76	22, 740, 482. 75	190, 759, 312. 77	310, 100, 321. 53
Proceeds, Federal water-power licenses			46, 323. 61	1, 329, 038. 53	1, 329, 038. 53
Proceeds, potassium royalties and rentals			1, 036, 249. 76	6, 622, 011. 92	6, 622, 011. 92
Receipts, naval petroleum reserves, 1920–38, act of May 9, 1938				29, 778, 300. 23	29, 778, 300. 23
Proceeds, rights-of-way over withdrawn lands, act of July 19, 1919			4, 483. 92	15, 577. 17	15, 577. 17
Lease of lands			16, 370. 58	68, 330. 40	68, 330. 40
Town lot sales			3, 553. 94	728, 199. 71	728, 199. 71
Timber sales and other miscellaneous items			73, 310. 34	264, 356. 87	264, 356. 87
Total			1, 180, 292. 15	38, 805, 814. 83	348, 906, 136. 36

[1] Credit; adjustment between States of Alabama and Arizona during the fiscal year.

TABLE 17.—Cost of plant, property, and equipment as of June 30, 1953

State or territory	Project	Completed works					Construction in progress	Other physical property	Total
		Multi-purpose (1)	Irrigation (2)	Electric (3)	Municipal water (4)	Flood control (5)	(6)	(7)	(8)
Alaska	Eklutna						$16, 813, 532		$16, 813, 532
	Knik Arm powerplant			$939			56, 828		57, 767
Arizona	Gila		$28, 362, 767				7, 620, 193		35, 982, 960
	Salt River	$5, 224, 890	10, 753, 356	4, 266, 443			3, 633, 863		23, 878, 552
Arizona-California-Nevada	Boulder Canyon:								
	All-American Canal system	40, 646, 259	14, 982, 053	45, 091		$3, 329, 786	470, 317		59, 473, 506
	Boulder City						5, 328	$5, 391, 148	5, 396, 476
	Hoover Dam and powerplant	94, 351, 416		64, 705, 832			512, 384	1, 798, 800	161, 368, 432
	Imperial Dam						10, 843		10, 843
	Colorado River front work and levee system					7, 025, 792	2, 624, 054		9, 649, 816
	Davis Dam	35, 198, 289		68, 536, 168			9, 321, 904		113, 056, 361
	Parker Dam power	7, 173, 292		16, 936, 357			586, 471		24, 696, 120
	Yuma		5, 362, 143	435, 378			12, 774		5, 810, 295
	Yuma auxiliary		2, 266, 487						2, 266, 487
California	Cachuma	2, 096, 072					27, 792, 264		29, 888, 336
	Central Valley	215, 014, 843	59, 050, 947	65, 867, 407			50, 145, 089	4, 060, 884	394, 139, 170
	Orland		2, 565, 699						2, 565, 699
	Solano						1, 162, 538		1, 162, 538
Colorado	Colorado-Big Thompson	89, 212, 180	5, 704, 837	22, 344, 312			27, 998, 796		145, 260, 125
	Fruitgrowers Dam		200, 309						200, 309
	Grand Valley		6, 855, 459	213, 669					7, 069, 128
	Mancos		3, 894, 978						3, 894, 978
	Paonia		1, 490, 334				30, 150		1, 520, 484
	Pine River		3, 460, 493					21, 442	3, 481, 935
	San Luis Valley	3, 817, 561					983, 476		4, 801, 037
	Uncompahgre		8, 965, 959						8, 965, 959
Idaho-Oregon	Boise	36, 077, 114	21, 343, 244	6, 138, 554			260, 833		63, 819, 745
Idaho	King Hill		1, 987, 854						1, 987, 854
	Lewiston Orchards	426, 999	1, 028, 014		$990, 793		38, 589		2, 484, 395
	Preston Bench		449, 554						449, 554
	Rathdrum Prairie		482, 360						482, 360
Idaho-Wyoming	Minidoka	8, 689, 975	13, 517, 086	2, 663, 226			587, 046		25, 457, 333
	Palisades						14, 073, 161		14, 073, 161

TABLE 17.—Cost of plant, property, and equipment as of June 30, 1953—Continued

State or territory	Project	Completed works					Construction in progress	Other physical property	Total
		Multi-purpose (1)	Irrigation (2)	Electric (3)	Municipal water (4)	Flood control (5)	(6)	(7)	(8)
Montana	Bitter Root		$955, 051				$37, 037		$992, 088
	Buffalo Rapids		3, 763, 993				438, 158		4, 202, 151
	Frenchtown		290, 797						290, 797
	Hungry Horse	$18, 524		$4, 578, 561			95, 082, 442		99, 679, 527
	Huntley		1, 552, 159						1, 552, 159
	Intake		92, 371						92, 371
	Milk River		8, 951, 559				388, 785		9, 340, 344
	Missoula Valley		278, 321						278, 321
	Sun River		9, 888, 906				76, 382		9, 965, 288
Montana-North Dakota	Fort Peck			10, 326, 390			614, 201		10, 940, 591
	Lower Yellowstone		3, 633, 219						3, 633, 219
Nebraska	Mirage Flats		3, 044, 064						3, 044, 064
Nebraska-Wyoming	North Platte	3, 250, 388	16, 202, 635	1, 410, 045			540, 675		21, 403, 743
Nevada	Humboldt		1, 214, 321						1, 214, 321
	Newlands		7, 555, 136	344, 343					7, 899, 479
Nevada-California	Truckee storage		1, 092, 423						1, 092, 423
New Mexico	Carlsbad		4, 243, 038				837		4, 243, 875
	Fort Sumner		2, 427, 292					$5, 050	2, 432, 342
	Hondo		371, 788						371, 788
	Middle Rio Grande						2, 654, 322		2, 654, 322
	Tucumcari		15, 200, 162				56, 665		15, 256, 827
	Vermejo						566, 230		566, 230
New Mexico-Texas	Rio Grande	8, 072, 022	10, 368, 166	7, 022, 420		$263, 930	189, 607		25, 916, 145
	Rio Grande River rectification		180, 628						180, 628
North Dakota	Buford-Trenton (old)		223, 423						223, 423
	Buford-Trenton (water conservation unit)		940, 652						940, 652
	Williston		409, 095						409, 095
Oklahoma	W. C. Austin	6, 903, 161	5, 258, 247		$152, 026				12, 313, 434
Oregon	Arnold						1, 387		1, 387
	Baker		281, 589						281, 589
	Burnt River		601, 026						601, 026
	Deschutes		11, 066, 325	515, 304			625, 465		12, 207, 094
	Grants Pass						146, 918		146, 918
	Ochoco						694		694
	Umatilla		5, 304, 167						5, 304, 167
	Vale		4, 904, 770						4, 904, 770
Oregon-California	Klamath		13, 703, 476				492, 729	13, 845	14, 210, 050
Oregon-Idaho	Owyhee		19, 108, 170						19, 108, 170
South Dakota	Belle Fourche		4, 638, 236				389, 317		5, 027, 553
	Rapid Valley	927, 271							927, 271

Texas	Balmorhea		407, 741						407, 741
	Colorado River	23, 499, 080		464, 801					23, 963, 881
Utah	Hyrum		953, 854						953, 854
	Moon Lake		1, 799, 859						1, 799, 859
	Newton		712, 592						712, 592
	Ogden River		5, 013, 284						5, 013, 284
	Provo River	15, 028, 716	3, 596, 794		12, 831, 311		318, 571		31, 775, 392
	Sanpete		433, 940						433, 940
	Scofield		943, 837						943, 837
	Strawberry Valley		3, 345, 939	91, 969				61, 086	3, 498, 994
	Weber Basin						2, 523, 678		2, 523 678
	Weber River		2, 725, 885						2, 725, 885
Washington	Columbia Basin	159, 506, 807	119, 147, 532	108, 590, 571			61, 616, 198	4, 327, 145	453, 188, 253
	Columbia Basin (interest)	6, 013, 377		3, 687. 841					9, 701, 223
	Okanogan		1, 507, 973				21, 166		1, 529, 139
	Yakima	4, 444, 965	39, 215, 368	1, 229, 175			1, 548, 303		46, 437, 811
Wyoming	Eden						3, 463, 652		3, 463, 652
	Kendrick	5, 159, 169	9, 042, 405	8, 371, 034			3, 001, 803		25, 574, 411
	Riverton	2, 968, 314	15, 656, 728	435, 373			1, 516, 861		20, 577, 276
Wyoming-Montana	Shoshone	1, 885, 912	14, 203, 202	3, 515, 533			1, 597, 834		21, 202, 481
Various	Missouri River Basin	96, 686, 226	11, 975, 376	54, 265, 842			107, 989, 789	322, 331	271, 239, 564
	Soil and moisture conservation						49, 046	214, 284	263, 330
	Other physical property							4, 855, 568	4, 855, 568
	Total	872, 292, 822	581, 151, 447	457, 002, 583	13, 974, 130	10, 619, 508	450, 689, 185	21, 071, 583	2, 406, 801, 258

NOTE.—Irrigation plant listed at gross construction cost prior to deduction of chargeoffs authorized by Congress.

COMPTROLLER

The Office of Comptroller continued to discharge its functions of enforcement of financial policy, internal and external audits and review in matters of repayment contracts, analyses of rate schedules, municipal finances and management, and investigational reports and legislation. It engaged in intensive efforts to develop improved audit techniques and in appraising the financial aspects of operations and financial policies.

During the fiscal year 1953 audit activity was extended to 44 major projects, the headquarters offices in Washington and various field offices. This work dealt with immediate accounting and financial problems.

A comprehensive financial audit of the Boulder Canyon project (All-American Canal) was performed at the request of the Secretary's representative.

The books and records of the construction contractor on the Eklutna project, Alaska, were examined at the request of the Chief Engineer in connection with contract adjustments and settlements due the contractor.

A special assignment developed requisite data relating to the obligation of the Metropolitan Water District of California and to provide the district with classified cost data and cost allocations. The material developed served as a basis for satisfactory settlement of its contractual obligation of approximately $3,300,000.

During the year, the Comptroller's Office conducted a general review of the Milk River project, Montana, accounts; a special study of accounting problems and an inventory of legal determinations required in connection with the disposition of revenues of the Klamath project, Oregon; and a detailed review of operating income and expense of the Gila project, Arizona, covering the period since operations commenced.

Special surveys were made of 12 projects and offices.

Comprehensive financial audits accomplished during the year included the initial audits of the Boise and Minidoka projects in Idaho.

LEGAL

Legislation

At the close of the fiscal year 1952 several bills relating to activities of the Bureau of Reclamation were in the final stages of enactment by the Congress or were before the President for his approval. All such bills were placed on the statute books of the United States during the first days of fiscal year 1953.

During approximately one-half of this fiscal year the Congress was not in session. Between the convening of the 83d Congress on January 3 and June 30, 1953, no legislation directly concerned with the affairs of the Bureau was enacted. At the end of the fiscal year numerous bills affecting the reclamation program were in various stages of the legislative process.

Litigation

Litigation and claims of concern to or directly affecting the Bureau of Reclamation placed a heavy work load on attorneys for the Bureau during the year ending June 30, 1953. Among such actions were the following:

1. The United States Circuit Court of Appeals, Tenth Circuit, confirmed the dismissal of the district court in the case of *State of New Mexico and City of Truth or Consequences* v. *Labon Backer*, *et al.* (an officer of the Bureau). This was a suit to enjoin the defendants from draining Elephant Butte Reservoir.

2. The action entitled *United States* v. *Coachella Valley County Water District*, in the United States District Court, Southern District of California, Central Division (Los Angeles), was instituted to obtain a declaratory judgment to determine the respective rights and obligations of the parties under their contract of December 22, 1947, for construction of the Lateral Distribution System and other works, Coachella Division, All-American Canal System, particularly as to whether or not the district was liable for increased construction costs over and above $13 million, the amount specified in the contract. On March 12, Judge Westover rendered his opinion finding against the United States. Judgment had not been entered at the close of the fiscal year.

3. *Owl Creek Irrigation District* v. *Fred Bryson*, *et al.*, in the Supreme Court of Wyoming, was an action instituted in the District Court of Hot Springs, Wyo., asking for confirmation of the water service contract between the Owl Creek Irrigation District and the United States and the assessments thereunder. On appeal to the Supreme Court from the lower court's order granting the petition and confirming the validity of the contract proceedings and assessments thereunder, the appellants attacked the excess-land provision in the contract as unconstitutional. The Supreme Court reversed and remanded the case to the district court with instructions that the privately-owned lands of all objectors should be excluded from the area of the irrigation district and that the contract should be rectified and altered in accord with the decision. A petition for rehearing was denied in June 1953.

4. *Stark*, *et al.* v. *Heart River Irrigation District*, filed in the Supreme Court of North Dakota, was an action instituted in the District Court for Morton County, N. Dak., to review the Heart River Irrigation District Board of Directors' order denying a petition for exclusion from the district of lands classified as irrigable by the Bureau of Reclamation. The action came before the Supreme Court on motion by respondents to dismiss the appeal taken by the defendant, Heart River Irrigation District, from an adverse judgment of the district court. The motion was denied and the case was heard and decided on its merits. The Supreme Court modified the judgment and remanded the case to the district court with directions to enter judgment in conformity with the opinion. A petition for rehearing by the respondents was denied and in January 1953 the Supreme Court heard oral arguments on questions of law certified to it by the district court. In May, it handed down its decision affirming its previous action in the case and holding that the answer of certified questions was unnecessary because its basic decision affirmed the inclusion of all objectors' lands except those excluded by stipulation.

5. *Hudspeth County and Reclamation District No. 1* v. *H. E. Robbins*, *et al.* (an officer of the Bureau), a suit for declaratory judgment to establish the water rights of the plaintiff and to enjoin officers of the United States from impounding and diverting certain waters allegedly belonging to the district was originally filed in the District Court for Hudspeth County, Texas, and later removed to the United States District Court, Western District of Texas, El Paso Division. On the plaintiff's motion for partial summary judgment and on the defendant's motion for summary judgment, the court ordered that relief sought by the plaintiff be denied. Notice of appeal by the plaintiff has been filed.

6. *El Paso County Water Improvement District No. 1 and the United States*, *et al.* v. *The City of El Paso*, was filed in the United States District Court, Western District of Texas, El Paso Division, in January 1953, to resolve a number of controversies existing between the litigants, including the extent of certain alleged water rights of the city, the validity of controlling obligations previously entered into, the validity of conveyances of the Franklin Canal right-of-way, and obligations for maintenance of bridges. A hearing on this action is anticipated during the October term of the court.

7. The action entitled *United States* v. *Northern Colorado Water Conservancy District*, *et al.*, filed in the United States District Court for the District of Colorado in 1949 is still pending. Numerous parties have since intervened and there are approximately 50 defendants in the action. The action affects claims to the use of water in connection with the Colorado-Big Thompson project, and the priority of

rights of the United States, the city of Denver, the city of Colorado Springs, the Moffett Tunnel & Water Development Co. and the South Platte Water Users' Association.

8. The United States District Court for the Eastern District of Washington in the action entitled *United States* v. *Sivert Anderson, et al.*, ruled in favor of the Government's position that State statutory provisions granting canal easements over State lands were applicable to and could be utilized by the United States in construction of the Columbia Basin project canal system. This decision is contrary to a similar case which was before a court in another jurisdiction.

9. In connection with the action entitled *State of Arizona* v. *State of California, et al.*, in the Supreme Court of the United States, the United States filed a motion for leave to intervene which was granted by the Court in January 1953. By this action the State of Arizona seeks a determination of its rights in and to the use of the waters of the Colorado River, as against such rights claimed by the defendants under the Colorado River compact, the Boulder Canyon Project Act, and the California Limitation Act.

10. Trial of the purported class action entitled *Everett G. Rank* v. *Julius A. Krug*, began in the United States District Court for the Southern District of California, before Judge Pierson M. Hall. This is a suit to enjoin certain named Federal officials in the operation of Friant Dam and Reservoir, Central Valley project, California. Trial of the case has not been concluded. Approximately 14 other actions involving the Bureau of Reclamation which have been filed in the same court have been held in abeyance pending developments in the *Rank* v. *Krug* case.

11. The Bureau of Reclamation has cooperated with the General Services Administration and private industry in the conduct of an important nationwide case before the Interstate Commerce Commission involving freight rates on the commodity fly ash which is used extensively as a pozzolan in Bureau of Reclamation concrete construction. Representatives of the Bureau have testified on behalf of the United States. A Bureau counsel has entered his appearance in a hearing of this case before an examiner for the Interstate Commerce Commission at hearings in Chicago in January 1953, and has assisted in briefing the case on behalf of the United States. The following dockets were consolidated by the examiner for hearing at Chicago and heard on a single record:

> Investigation and Suspension Docket No. 6018 involving rates on fly ash within official territory.
>
> Investigation and Suspension Docket No. 6050 involving rates on fly ash within transcontinental territory.

Complaint Dockets Nos. 31088 and 31089 involving rates on fly ash within official territory.

Complaint Docket No. 31100 which places into issue all fly ash rates east of the Rocky Mountains.

Docket No. 31140, General Investigation Docket entered by the Interstate Commerce Commission upon its own motion for investigation of rates on fly ash within transcontinental territory.

The outcome of this case will have a profound influence on the cost of pozzolanic materials to the Bureau of Reclamation.

In addition to the above cases the following actions involving claims by contractors with the United States for alleged increased costs, liquidated damages, war hardships and shortage of funds required the attention of Bureau attorneys: *W. E. Barling* v. *United States*, Court of Claims No. 49190; *Peter Kiewit Sons Company and Morrison-Knudsen Company, Inc.* v. *United States*, Court of Claims No. 283–53; *Union Paving Company* v. *United States*, Court of Claims No. 48241; *Warner Construction Company* v. *United States*, Court of Claims No. 48769; *Winston Brothers Company*, *et al.* v. *United States*, Court of Claims No. Cong. 6–52, and others.

Various other actions relating to application for the appropriation of water, condemnation proceedings, and tort claims affecting the Bureau of Reclamation were settled, continued, or filed during the fiscal year.

MANAGEMENT PLANNING

Substantial savings and improved coordination in Bureau operations were effected during fiscal year 1953, and the groundwork laid for increased future benefits, through the management planning program.

To provide a means for more effective utilization of personnel the work-staff analysis project, which relates the number of employees engaged in each type of work to pertinent work factors reflecting the amount of work programmed and accomplished, was extended and improved.

Employee participation in efforts to improve Bureau operations was systematically encouraged and rewarded. Total savings in the first year following adoption of suggestions and consummation of improvements by employees was close to half a million dollars. The increasing success of the Reclamation incentive awards program is shown in the following data for the year: 536 employee suggestions submitted; 189 (35 percent) adopted—for which employees were paid over $6,000, or 3 percent of the estimated Bureau savings of $204,000; 100 honor awards and 81 superior accomplishment awards granted;

6 efficiency awards made, for which 9 employees were paid $3,500 on the basis of Bureau savings of $268,000.

The systematic identification and resolution of problems impeding Bureau operations is a major objective of the management improvement program sponsored by the Office of Management Planning. At the beginning of the period the Commissioner's staff and the regions had scheduled 147 identified problems for action during fiscal year 1953. At the end of the year, they had analyzed and taken action on 104 of these problems and were engaged in the analysis of others.

In the process of keeping the Reclamation Manual up to date and improving its composition and content, over 250 releases prepared by the Commissioner's staff were reviewed and their clearance coordinated by the Office of Management Planning. A complete set of organization handbooks in Reclamation Manual form was developed and distributed within the Bureau, providing officials and employees with current information on approved Bureau organizational arrangements and assignments of responsibility.

A new policy was established requiring periodic, formally organized reviews of operative office activities by teams of regional office technical and administrative personnel.

A program was inaugurated for stimulating worldwide dissemination of administrative techniques in resource management. The University of Colorado collaborated with the Bureau in presenting a 16-week course in Fundamentals of American Administration to student engineers from 11 foreign nations. Participants unanimously recommended that similar instruction be provided all foreign trainees. This experience illustrates the need for international training in management methods, adapted to resource programs, throughout the world.

PERSONNEL

Bureau employment dropped from 13,846 full-time employees at the beginning of the year to 11,665 at the closing. More than half of the decrease was accomplished by reduction-in-force action during May and June 1953.

No particular staffing difficulties were encountered during the year although beginning engineers continued in short supply. Steps were taken to strengthen the Bureau's college relations program. Representatives from the regional and Denver offices visited colleges in the West, Midwest, and South during the fall of 1952. During the year the Central Board of Civil Service Examiners had examinations open to engineers, engineering aides, draftsmen, and construction inspectors. A total of 1,050 applications were processed, leading to 262 appointments.

An evaluation of the Bureau's promotion program showed that almost 80 percent of all classified employees were promoted into their present positions. More than 90 percent of the employees at grade GS–9 and above were promoted to their positions.

Satisfactory progress was made on employee training and development activities. The Bureau again had 6 participants in the departmental management training program and 1 employee on an exchange training assignment with the Department. Supervisory training conferences were continued in region 1 and initiated in other regions. Continued emphasis was placed on beginning engineer rotation, junior management assistant training, apprenticeship programs, and powerplant and substation operator training.

Surveys of field operations under the plan for personnel management review and improvement were carried out in two regions during the year. The plan proved very useful as a device for measuring the effectiveness of personnel programs in the actual operating area and for pointing up areas for improvement, particularly in the training and employee relations fields. Employee participation was excellent and findings were accepted by local top management. With wider use, the plan will provide a groundwork for further improving the personnel and management activities of the Bureau. Additional field surveys as well as follow through on those already completed are scheduled for the next fiscal year.

A plan was launched during the year to bring about improvements in the process by which employees are selected for promotion, reassignment, and transfer. Major objectives for the next year will be to achieve further improvements in this area as well as in our recruitment, promotion, manpower utilization, and employee development programs.

Procedures governing the administration of the Classification Act of 1949 within the Bureau were completely revised through the issuance of new manual releases. Numerous reviews of proposed civil service position classification standards were made. Various regional Civil Service classification audit teams, which visited Bureau offices, participated in a rather comprehensive review of position descriptions during the year to determine their adequacy and accuracy and correctness of grade allocation. The foreign activities program added substantially to the classification workload. Objectives for the forthcoming year are to further improve the quality of the classification program through the development of management appreciation of the program; and, further, to review with management all position requirements necessitated by a reduced program and reorganization of the Bureau.

Three additional collective bargaining type labor agreements were signed, making a total of five such agreements in existence. The new agreements cover all ungraded employees of the Central Valley project in the Sacramento Valley and delta district, and all power operation and maintenance ungraded employees in regions 6 and 7 of the Bureau. Looking toward improvement in wage administration, a study was completed and a new wage plan recommended to take into consideration tenure of employment when establishing rates of pay for ungraded positions. Under this plan, certain inequities created by the present system would be eliminated. Abolishment of wage controls by the President permitted the installation of new wage rates upon approval by proper Bureau officials, thus eliminating prolonged delays in bringing wage rates up to negotiated locality rates.

The Bureau's efforts to develop and administer the safety program for the protection of personnel against occupational hazards met with encouraging success. Of significant importance was the progress accomplished in reducing the number and severity of occupational injuries. Accidents were reduced 36 percent below the rates for 1952. On contract operations accidents were reduced 13 percent as compared to the 1952 experience while the severity rate increased 4 percent. Publication of a new safety handbook for use on work to be performed on construction contracts will be issued early in fiscal year 1954. The Federal employee health program continued to operate at the Denver Federal Center.

SUPPLY

Aircraft Operations

During the latter part of the year decision was made to reduce the Bureau's fleet of aircraft to a total of 5 by disposal of the 10-passenger Lockheed, 1 of the 5-passenger Beechcrafts, and 1 of the 3-passenger Navions. This will reduce the fleet to 1 twin-engine Beechcraft which is assigned to Billings, Mont., and is used for aerial photographic and survey work, as well as for transportation of Bureau personnel; three single-engine 3-passenger Navions which are assigned 1 each to the Missouri-Oahe district in region 6, the Kansas River district in region 7, and the Columbia River district in region 1, and the Bell Helicopter assigned to Parker-Davis power project in region 3 for power line patrol work.

Procurement

During the year the Bureau operated under the Controlled Materials Plan and the priorities systems developed in connection therewith. Although some materials were quite scarce and others were generally hard to get, the Bureau was able to obtain practically all of its requirements for ratings and allotments.

During the year the Bureau developed standard specifications covering 14 items of equipment and promulgated them to field offices for their use in purchasing such items. Due to continual changes of design by the manufacturers, a continual review of these specifications has been necessary in order to avoid any favoritism to any one supplier. Because of their completeness, other governmental agencies are using Bureau of Reclamation specifications when buying this type of equipment.

Efforts were continued to reduce Bureau transportation costs. It is estimated that about $500,000 was saved through the efforts of procurement personnel engaged in freight rate and routing work.

Sales activities which are handled by procurement personnel increased materially due to the Bureau's intensified efforts to dispose of known surpluses in order to reduce to the lowest possible limits our personal property inventories. Through Bureau procurement offices there was disposed of by sale property which originally had cost $1,765,341. The Bureau realized through these sales $585,000, or about one-third of the original acquisition cost of this surplus property.

Property Management

A consistent effort was made to reduce the number of Bureau housing units. A number of housing units, particularly those located in existing communities, were declared surplus and disposal action taken. Another step taken during the year to reduce the Bureau's investment in housing was the adoption of a policy of using wherever and whenever possible relocatable type of housing units including house-type trailers.

A new method of marking and identifying Bureau vehicles was perfected. It includes the use of precut paper stencils and the application of enamel by either the spray or brush method. In this connection approval of elimination of the shield that permits use of this method was obtained from the Bureau of the Budget.

Service Management

Service management functions throughout the Bureau were materially improved. Notable progress was made in the development of records disposal schedules and in reducing the volume of the Bureau's active files. Two tons of paper records were disposed of in one office as the result of one disposal authority. Progress was also made in the program to prevent the creation of new record material. Many papers and documents that formerly were sent to the Washington office of the Bureau were eliminated. It is estimated that this action will result in eliminating the receipt and handling of some 25,000 documents annually in the Washington office.

FISH AND WILDLIFE SERVICE

John L. Farley, Director[1]

The Fish and Wildlife Service exercises Federal responsibilities for the conservation of the fishes, birds, and mammals that comprise an important part of our natural resources. The economic values of these resources are tremendous; their recreational and esthetic values are beyond exact assesssment.

During the fiscal year 1953 the Service, through the basic research essential to wise management and through direct management of certain resources, continued its efforts to ensure prudent use and conservation of resources utilized commercially and those for recreation.

INTERNATIONAL COOPERATION IN CONSERVATION

International Conservation Agreements

During the fiscal year 1953, the Service continued its participation in international cooperation to conserve natural resources, largely by representation on several commissions.

The International Convention for the High Seas Fisheries of the North Pacific Ocean, signed in Tokyo on May 9 by Japan, Canada, and the United States, became effective on June 12, 1953. It is expected that the Commission provided for in the convention will soon be estabished and that the problems arising from the interests of the three nations in the North Pacific Ocean will be brought under study.

In May 1953, the International Commission for the Northwest Atantic Fisheries held its third annual meeting. Its most significant accomplishment was the adoption of a research program that, for the irst time in the history of the fisheries of the Northwest Atlantic, will direct toward a single objective the efforts of more than 100 scientists, a dozen vessels, and 15 research laboratories of 10 nations. The restriction on the size of gear used in the haddock fishery off the New England coast, adopted by the Commission at its second annual meeting in 1952, became effective on June 1, 1953.

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[1] On May 25, 1953, John L. Farley succeeded Albert M. Day as Director.

The International Pacific Salmon Fisheries Commission continued its efforts toward restoration and conservation of the important sockeye salmon runs in the Fraser River system. The Commission met three times during the year to revise regulations for the fishery and to study plans for research during the coming year. The Inter-American Tropical Tuna Commission held one meeting during the year. This Commission has made significant progress in biological research on the tunas and bait fisheries of the eastern equatorial Pacific Ocean. The International Whaling Commission held its fifth annual meeting in London, beginning on June 22, 1953.

The Indo-Pacific Fishery Council held its fourth annual meeting in Manila from October 23 to November 7, 1952. The Council, which has 15 member governments, was established to encourage and promote a rational development of the fisheries of the Indo-Pacific area.

The International Fisheries Commission (Pacific halibut) met once during the year to revise regulations for the fishery and to consider research for the coming year. A new halibut convention was negotiated and signed by the United States and Canada on March 2, 1953, although it has not yet been ratified by either signatory. The new convention increases the number of Commissioners from 4 to 6, and increases the regulatory powers of the Commission to permit greater use of the halibut stocks.

During the year, the Service and the Department of State met with officials of the Canadian Government to discuss a possible convention for coordination of research and eradication of the parasitic sea lamprey in the Great Lakes. Considerable progress was made at the conferences in December 1952 and February 1953. It is expected that negotiations will be continued late in 1953.

International Technical Cooperation

One of the vital problems facing the nations of the world is that of producing more food for ever-increasing populations. In many underdeveloped countries, food of animal origin is inadequate to meet the dietary need of the people. Food from the sea is particularly important because it supplies deficiencies in proteins, vitamins, and minerals at low cost. In countries bordering upon the sea, it is usually possible to augment these food supplies in important amounts by introducing new and improved methods of capture, preservation, transport, and marketing. Low-cost preservation and marketing are important to ensure distribution to the interior of the country. The needs of inland regions can sometimes be met in part by development of the natural fisheries of lakes and streams and by the culture of fish in ponds. Development of inland fisheries is particularly significant because it avoids the necessity of transporting products from distant seacoasts.

The Fish and Wildlife Service is assisting the Technical Cooperation Administration in carrying out the point 4 program of technical assistance to foreign nations. During the fiscal year 1953, technicians were carrying on the fishery-development projects in Mexico, Peru, El Salvador, India, Iran, Liberia, Lebanon, Egypt, and Indonesia. In addition, technologists made preliminary studies of the fishery resources and industrial facilities in the Dominican Republic and Colombia.

The nature of the project differs considerably in the several countries, but in every instance the activities are directed toward improvement of the diet of the people by proper exploitation and development of the fishery resources for domestic use. Since the stage of development of the fisheries parallels industrial and economic development in these countries, problems of conservation are seldom urgent but must be kept in mind. Our technicians, as advisers to the foreign governments, are frequently called upon to aid in reorganizing or establishing government agencies for administering the fisheries and for continuing the work of promotion and development.

Training in the United States of foreign technicians and fishery officers to carry on the work of development projects initiated by our fishery missions continues to play an important part in the foreign-aid program. In some countries where a fishery mission has not yet been established, fishery-development programs are directed by officers trained in the United States. Pakistan, for example, now employs a skilled pond-fish culturist, a fresh-water fishery expert, a fishery-product technologist, and a general administrative officer who received training here last year, and has sent three other specialists for training in fish production, marketing, and economics. During the past year, training in several branches of fisheries science and development has been provided for students from Iraq, India, Pakistan, Thailand, and Cuba, and assistance has been given to visitors from numerous foreign countries.

UTILIZING THE FISHERY RESOURCES

Activities in the fields of exploration, development, and utilization of the Nation's commercial fishery resources were varied and widespread during the year.

The exploratory-fishing vessel *John N. Cobb* engaged in offshore salmon research near the western Aleutian Islands as part of the preliminary investigations in connection with the new convention for the North Pacific fisheries. Explorations were also conducted in the northeastern Pacific for albacore tuna, deepwater bottom fish, Alaska herring, and shrimp.

In the Gulf of Mexico, some encouragement for a new tuna industry was seen from the work of the exploratory vessel *Oregon*. Several kinds of tuna have been caught in the gulf and northern Caribbean. Good sources of live tuna bait were located, and more exploration of the tuna resource is scheduled.

Further exploration for New England bluefin tuna revealed that this species, of a size excellent for canning, was present over a wide area in the Gulf of Maine during the summer. Catches were made with Japanese-type longline gear used for the first time in domestic fishing.

Experiments in locating commercial fish by means of underwater listening devices were continued. An underwater television camera was developed for studying fishing gear in operation.

Experimental work was continued on the new method of freezing whole fish at sea for later thawing, filleting, and refreezing ashore. Commercial-scale tests on the research trawler *Delaware* demonstrated that the process is mechanically feasible. Pilot-plant and laboratory tests ashore proved that the frozen fish could be thawed satisfactorily and that uniformly high-quality frozen fillets could be produced from the fish frozen at sea. A new brine freezer designed for more efficient handling and freezing was installed on the trawler *Delaware* in June 1953.

Research work on fishery byproducts provided considerable information on (1) the vitamin content and nutritive value of many commercially important fish meals; (2) the unknown growth factor of fish waste; and (3) the amino-acid content of salmon eggs.

At the request of representatives of the fishing industry all research projects in the 1953 technological program that were not completed will be continued in fiscal year 1954. An important project to find new uses for fish oils will be initiated. The freezing-fish-at-sea project will be extended to include a production-cost study of the whole operation on a commercial basis.

In accordance with the authority vested in the Department by the Fishery Cooperative Marketing Act of 1934, numerous fishery cooperative-marketing associations were visited during the year and reports were made on their condition and activities. As of May 1953 there were 73 active fishery cooperative-marketing associations in the United States, as compared with 69 in May 1952.

Facts and data about transportation cases and international-trade problems were assembled. Exhibits and testimonies were submitted in cases before the Interstate Commerce Commission, to show the effect on distribution of fishery products of proposed changes in transportation rates and charges. Information was also supplied to the industry and to the Congress on transportation problems. Domestic tuna interests and other groups were furnished information and assistance on international-trade problems.

At the request of members of Congress, a comprehensive survey was made of the domestic tuna industry. Among other studies, an analysis of consumer preference for fishery products, by regions, was completed.

Operation of seven Fishery Market News Service field offices at Boston, New York City, Hampton (Va.), New Orleans, San Pedro, Seattle, and Chicago was continued. Full-time and part-time marketing specialists in fishing and distribution centers gathered current production and marketing information on fishery products. Market news information was used as a basis for defense regulation, in a number of Tariff Commission and congressional hearings, and was relied on extensively by all segments of the fishing industry. In 16 years of operation of the news service, use of the data has constantly increased. The field offices handled Defense Fisheries Administration field activities and acted as liaison between the trade and DFA.

Monthly publication of Commercial Fisheries Review was continued, featuring articles on the fisheries, news of trends and developments in domestic and foreign fishery industries, and Government orders affecting fisheries.

Home economists of the Service conducted 158 fish-cookery demonstrations for school-lunch staffs and 17 special demonstrations for homemakers, institutional managers, and educational groups. Extensive demonstration programs were carried on in cooperation with 7 States, and in 7 other States a limited number of demonstrations were given at "workshops," summer-school sessions, and special meetings. Increases of up to 80 percent in the use of fishery products have resulted.

The program to increase the sale and distribution of frozen fishery products through the locker plants of the United States was carried on in 7 States. Special emphasis was given in Iowa since it has the greatest concentration of locker plants of any State.

Monthly reports on the fishery supply and quarterly market-outlook reports were issued for the guidance of restaurants, food chains, fishery associations, and Government organizations. The technical abstracting service on commercial fisheries was continued on a monthly basis.

The distribution of motion pictures through 60 public and private film subdepositories and their showing over television networks were continued. Production of a motion picture on the shrimp industry is in progress.

During the fiscal year, general statistical surveys for 1951 data were conducted for all sections of the United States except the Mississippi River and its tributaries. Tabulation and publication of the data are in progress and will be completed during the fiscal year 1954. Surveys covering the calendar year 1952 were begun in all coastal areas, and arrangements were made to obtain data on the catch of fishery products in the Great Lakes.

Monthly and annual bulletins on the landings of fishery products in Maine and at the principal Massachusetts ports and monthly bulletins on landings in New Jersey, Florida, Mississippi, and Texas were continued. Monthly bulletins were released also on the freezings and holdings of fishery products and on the production of fish meal and oil in the United States and Alaska. Annual bulletins were issued on the production of canned fishery products and byproducts and on United States trade in fishery products.

Collection of more detailed data on landings of fishery products at Portland and Rockland, Maine, was undertaken to fulfill the Service's obligations resulting from the establishment of the International Commission for the Northwest Atlantic Fisheries.

Responsibility was assumed for the enforcement of regulations regarding minimum mesh size in the otter trawls of the United States vessels fishing for haddock in the Northwest Atlantic.

ADMINISTRATION OF ALASKA FISHERIES

Management of the Commercial Fisheries

In Alaska the Federal Government, through the Fish and Wildlife Service, is responsible for the protection and conservation of the fishery resources which form the basis of the Territory's most important industry. The calendar year 1952 set a new record for the number of fishermen, number of fishing boats, and units of gear operating in Alaska. Never in the history of the Territory has exploitation of the fisheries been so intense, and never has the need been so great for vigorously enforced, sound regulatory controls.

Fishery-conservation activities in Alaska during 1952 were administered by 31 permanent fishery-management biologists and enforcement agents. This supervisory staff was augmented by 7 game-management agents on detail from the States, 132 seasonal patrol agents, stream guards, and fishery aids employed by the Service, and 25 seasonal employees of the Territorial Fisheries Board. Patrol and transportation were provided by 7 seagoing vessels, 20 speedboats, and numerous small craft. In addition, 19 airplanes were employed for a total of 2,013 hours of flying time.

There were 140 cases of violations of the Alaska fishery laws and regulations in 1952, involving 312 individuals and 5 companies. Of these defendants, 274 were found guilty and 6 were acquitted. Cases against 23 were dimissed, 2 were dropped, and 7 were pending at the end of the year. Fines amounted to $63,735, of which $500 was suspended, and jail sentences totaling 975 days were imposed, of which 965 were suspended. Receipts from the sale of confiscated fish amounted to more than $15,000.

Weirs were operated in 17 streams to obtain precise information on time of arrival and duration of the runs of salmon, and to determine the ratio between catch and escapement. The success of spawning was measured by downstream-migrant sampling weirs.

Pribilof Islands Fur-seal Industry

There were taken on the Pribilof Islands in 1952, 63,922 sealskins, as compared with 60,689 in the preceding year. In accordance with the provisional agreement of 1942, 20 percent of the take was delivered to the Canadian Government. The byproducts plant on St. Paul Island produced 363 tons of meal and 35,030 gallons of oil, which was sold for $56,809.15 gross.

Two public auction sales of fur-seal skins were held at St. Louis, Mo., during the fiscal year ending June 30, 1953. A total of 26,521 fur-seal skins was sold on October 13, 1952, for the gross amount of $2,784,398. At the same time, 405 Pribilof Islands fox pelts brought $1,575.62. On April 13, 1953, 24,400 fur-seal skins were sold for $2,084,191, and 404 blue-fox skins brought $1,873. In addition, a few sealskins were sold during the year for promotional purposes.

MAINTAINING THE INLAND FISHERIES

Fishing pressure on inland waters has again shown a significant increase—the result of population growth, increased popularity of sport fishing, and easier access to remote areas. At the same time, stream pollution from waste products and from soil erosion, greater use of water for irrigation, and exploitation of forest lands are continuing hazards to fish populations. It is apparent that conservation agencies, State and Federal, must redouble their efforts in management, if the stocks of game fishes are to be maintained at present levels.

The Service cooperates closely with the various State fish and game departments in the restocking of inland waters (including waters on Federal lands), conducts stream and water-impoundment studies to provide data for proper utilization and maintenance of the inland fishery resource, and provides thousands of farm-pond owners with initial stocks of pondfish. The Service operates 97 fish-cultural stations throughout the country in areas where assistance to the States is necessary to maintain the game-fish populations. Since many of these units have been operated for more than half a century, modernization and expansion of facilities are necessary to permit the increased production of fishes needed for restocking. Congress provided funds to continue the enlargement and improvement programs at the Lamar, Pa., and Warm Springs, Ga., stations. Construction of the new unit at Millen, Ga., was continued, and funds were provided for initiating the construction of a warm-water station at Frankfort, Ky., and for major repair work at the Crawford, Nebr., unit. In addition, funds were provided for the repair of flood damages at Fairport, Iowa, Genoa, Wis., and Guttenberg, Iowa, stations.

The salmon of the Pacific coast and Alaska have long been a major responsibility of the Fish and Wildlife Service and its predecessor agencies. Since about 1870 the Service has operated salmon-cultural units in the Pacific Coast States. During recent years it has been necessary for the Service to enlarge its activities greatly in connection with hatchery propagation and management of Pacific salmon. This increased emphasis was necessitated by the construction of major dams in the principal rivers that salmon used as migration routes to spawning areas. Grand Coulee Dam, the first such structure, blocked many hundreds of miles of spawning area in the Columbia River, and the Service had to undertake the transfer of the runs of salmon from above the dam to tributary streams below it. After 13 years of operation, this activity is a success. On the Sacramento River a similar condition was created by the construction of Shasta Dam, and there, too, the Service was able to maintain the fishery through management and hatchery operations. It is particularly noteworthy that salmon from the Coleman (Calif.) hatchery have contributed an average of at least 14 percent of the net fishery of the San Francisco Bay area.

A threat to the maintenance of the salmon populations on the Pacific coast is the current and proposed construction of additional major dams in the Columbia River watershed. To counteract so far as possible damage to the resource, the Service, in cooperation with the fisheries agencies of the States of Washington and Oregon, undertook in 1949 the rehabilitation and development of all possible tributary streams below the site of McNary Dam. The program envisioned the clearance of all obstructions to salmon passage from these streams, the laddering of impassable falls and small dams, the construction of hatcheries to develop more rapidly the lower-river populations and to contribute directly to the fishery, and the screening of irrigation and power diversions to preserve the downstream-migrating fingerling salmon. Funds have been provided by the Congress each year since 1949, and the construction of facilities necessary to the successful achievement of the objective is about half completed. It is anticipated that, through the combined efforts of the States and the Service, the greatest possible utilization of the lower-river streams for salmon production will be attained within about 10 years after completion of all facilities.

In water-use projects it is important that fish ladders and screening devices be provided to protect and maintain the trout and salmon in the rivers of the Northwest. At Rock Island Dam on the Columbia River, the fish ladders are regulated and operated by the Service; and in various watersheds throughout the Northwest the Service operates and maintains large fish-screening devices in irrigation diversions constructed by other Federal agencies. These installations prevent young downstream-migrating salmon and trout from entering irrigation canals and being lost on the irrigated fields. At Tracy (Calif.), the Service is cooperating with the Bureau of Reclamation in the design and operation of an immense screening installation on the Delta-Mendota irrigation canal. These activities and studies are continuing projects, although the work at Tracy may be completed within 2 or 3 years.

More than 17 million angling licenses were sold in the 48 States in 1952, an alltime high and almost 4 times the number of licenses sold annually in the early 1930's. Assuming that the average fisherman spent approximately $100 a season, it is estimated that devotees of this sport spent $1.7 billion.

There was a severe drain on the stocks of trout in inland waters. Greater emphasis was placed on the production of legal-sized trout to maintain the fishery, especially in those areas of greatest angler concentration. Studies on trout nutrition were continued in conjunction with the training program at the Cortland (N. Y.) fish-cultural station, and continuing programs of management improvement were followed at all hatcheries to increase production of trout to meet the demands for these fish.

The demand for warm-water fishes continued at a record level, as thousands of farm ponds and reservoirs were constructed throughout the United States. Programs for the management of fish populations in large impoundments required the production of additional predator species, such as the pikes, to control nongame species. Training programs for Federal warm-water fish-culturists were continued in conjunction with the Alabama Polytechnic Institute at Auburn

(Ala.) and at the Service's station at Marion (Ala.). Service biologists assisted project leaders at pond-fish stations in stepping up the production of warm-water species. A severe drought seriously affected the water level of farm ponds and reservoirs in the Southwest, including large sections of Texas, Oklahoma, New Mexico, and Colorado. It is expected that a return to normal conditions in this area will create a heavy demand for pond fish for restocking.

The demand for sport fishing has stimulated programs for construction of new fishing waters and for development of unexploited fishing potentialities of existing waters through fishery management. However, fishery management is a complex and relatively new field of conservation endeavor which will require expanded research for its guidance. Some increase in the number of fishery biologists in the various conservation agencies has brought improvement in fishery programs.

In cooperation with State conservation departments and with other Federal agencies the Service has developed fishery-management plans for selected areas. Such plans may recommend the use of hatchery fish but are not limited to this. Technical assistance and hatchery fish are supplied to help with the recommended plans, but construction and development work are the responsibility of the agency developing an area.

During the calendar year 1952 fishery-management planning for Federal areas had high priority. Fishery-management aid was given to 17 Veterans' Administration hospitals, 54 Army installations, 26 Air Force bases, and several Navy and Marine establishments. On most of these areas improvement of fishing opportunties appeared feasible, management programs have been established, and recurrent inspections are planned to assure continuing improvement in fishing success.

Fishery-management assistance to the Forest Service has been concentrated largely on the Green Mountain National Forest. Here a comprehensive plan for management of the streams and lakes is being developed as a pilot activity pointing toward a broader program to provide management assistance on forest areas. The cooperative program of recreational development on the Fort Apache Indian Reservation is outstanding and promises increased opportunity for public fishing.

Comprehensive fish-stocking programs have been established with consideration given to all available means of attaining more effective use of the hatchery product. The water areas served by several fish-cultural stations have been surveyed with a view to revising distribution programs to reflect management needs. Fall plantings of fingerling trout in streams have been generally abandoned since several research studies have indicated that this sort of stocking yields negligible return to the creel. However, stocking of fingerling trout in lakes and ponds is being continued as yielding good returns, particularly when populations of larger fishes are reduced or absent. Stocking of trout of catchable size for the creel continues to be the most feasible means of meeting demand in an increasing number of areas of high fishing pressure.

The following is a summary of the production of Federal hatcheries for the calendar year 1952:

TABLE 1.—Fishes and fish eggs distributed—Calendar year 1952

Species	Eggs (number)	Fry (number)	Fingerlings		Fish 6 inches or larger		Total weight, fingerlings and larger	Total number, fish and fish eggs
			Number	Weight	Number	Weight		
				Pounds		*Pounds*	*Pounds*	
Largemouth bass		757, 795	8, 129, 160	25, 754	18, 825	2, 984	28, 738	8, 905, 780
Smallmouth bass		439, 000	88, 565	686			686	527, 565
Rock bass			500	3	55	23	26	555
Bluegill [1]		1, 420	33, 322, 600	51, 059	2, 760	1, 045	52, 104	33, 326, 780
Redear sunfish			578, 250	951			951	578, 250
Black crappie			25, 000	357			357	25, 000
Channel catfish		353, 025	100, 310	1, 116	2, 680	169	1, 285	456, 015
Bullhead			462, 660	5, 844	400	100	5, 944	463, 060
Cutthroat trout	13, 365, 215	1, 151, 090	3, 877, 210	10, 786	14, 290	3, 556	14, 342	18, 407, 805
Rainbow trout	9, 245, 190		4, 405, 720	52, 512	1, 225, 765	232, 394	284, 906	14, 876, 675
Kamloops trout			71, 655	2, 072	28, 495	2, 576	4, 648	100, 150
Beardsley trout			9, 810	59			59	9, 810
Brown trout	3, 659, 950		1, 695, 095	11, 884	305, 945	63, 936	75, 820	5, 660, 990
Lake trout			264, 620	4, 424			4, 424	264, 620
Brook trout	7, 061, 815	215, 000	3, 239, 410	18, 805	553, 990	92, 585	111, 390	11, 070, 215
Dolly Varden			2, 280	34			34	2, 280
Chum salmon	5, 477, 565	11, 563, 885	1, 139, 080	1, 055			1, 055	18, 180, 530
Silver salmon			475, 815	14, 973	287, 200	21, 157	36, 130	763, 015
Red salmon	1, 699, 825		313, 815	4, 130	1, 165	70	4, 200	2, 014, 805
Kokanee			1, 684, 540	332			332	1, 684, 540
King salmon	24, 434, 660	8, 798, 020	54, 926, 350	218, 071			218, 071	88, 159, 030
Atlantic salmon		91, 000	140, 435	2, 821	16, 975	1, 737	4, 558	248, 410
Sebago salmon					17, 450	587	587	17, 450
Threadfin shad			2, 260	18			18	2, 260
American grayling	1, 227, 040	500, 000						1, 727, 040
Yellow perch			42, 415	561	2, 040	82	643	44, 455
Walleye		752, 000	48, 845	478			478	800, 845
Northern pike		6, 184, 750	95, 020	306	340	42	348	6, 280, 110
Winter flounder		117, 534, 000						117, 534, 000
American lobster		115, 000						115, 000
Total	66, 171, 260	148, 455, 985	115, 141, 420	429, 091	2, 478, 375	423, 043	852, 134	332, 247, 040

[1] Approximately 200,000 bluegill have been distributed, but not recorded at time of this report.

TABLE 2.—Land acquired or in process of acquisition for fish-cultural stations, fiscal year 1953

[In acres]

State and station	Acquired			Pending title conveyance
	By other than purchase	By purchase	Total	
Kentucky: Frankfort	114		114	
Massachusetts: North Attleboro	265		265	
Mississippi: Lyman				30
Oregon: Eagle Creek				126
Tennessee: Erwin				1
Wisconsin: Genoa		1	1	
Total	379	1	380	157

RESEARCH IN FISHERY BIOLOGY

Coastal Fisheries

International problems occupied an increasing share of attention in Pacific fishery research in the fiscal year 1953. Salmon fishing and crab fishing have been resumed on the high seas of the North Pacific, and exploitation of the fisheries by Japan, Canada, and the United States is the subject of a new convention signed by the three governments. A biologist aboard the research vessel *John N. Cobb* is making biological studies to determine whether the salmon stocks are of American or Asian origin, and to find the area of intermingling, if any. A biologist working with the Japanese crab fleet is investigating the biology of the king crab.

Canadian and Service investigators are collaborating on a study to develop means of protecting salmon at an irrigation project on the Okanogan River in British Columbia. This Columbia River tributary supplies a large part of the valuable catch of blueback salmon in the United States fishery at Astoria.

Service and Canadian biologists also collaborated in measuring herring spawning on the beaches of British Columbia and Alaska. This joint determination will increase the accuracy of catch forecasts.

Effect, on salmon runs, of dams and other water-use projects remains a problem on the Columbia River. Electrical fish guiding shows much promise of preventing or at least minimizing mortalities of seaward migrants and adults at each dam or diversion.

The mild winter permitted a more northern installation of counting stations in southeastern Alaska. Even though a cold spring slowed migration, 50,000 pink fry were marked by April 25.

Spawning-ground measurements of fish to determine destination of red-salmon stocks now being intensively exploited by the relatively new gill-net fishery indicate that reds are uniformly largest in Cook Inlet. West Side and Susitna races are generally intermediate in size, while Fish Creek and Kasilof reds are composed mostly of smaller size groups. Highly selective nets affect Kenai runs most, Fish Creek runs least. If sustained by succeeding years' observations, this information can be utilized directly in the management of the two fisheries.

Since 1950, phosphates and nitrates, added as fertilizer each summer in Bare Lake (Kodiak Island), have produced blooms of micro- and macro-plankton, important fish food. Work now in progress will indicate whether these blooms result in more red salmon.

As part of a coastwise investigation of Atlantic shad to provide fishery-management information for the Atlantic States Marine Fisheries Commission, shad-tagging experiments were conducted in St.

Johns River in Florida and in the Neuse River in North Carolina. Analysis of recoveries will yield information on migrations and fishery catch rate. A small-scale tagging was made at Neuse River Dam near Goldsboro to assess the effectiveness of the fishway. Test netting shows that shad are using the structures. Water from the steam-electric plant enters just above the fishway and raises the fishway water temperature 10° F. above normal. Shad stop moving at temperatures above 90° F., which occur in the fishway when low river flows prevail. A total of 105 shad passed while tests were being conducted.

More than 600 fish were attracted through the collection system below the pressure-type fishway installed at Holyoke Dam at Holyoke, Mass., on the Connecticut River; of these, 240 were passed through the fishway to the river above the dam. This will permit at least partial utilization of extensive spawning grounds above the dam.

A research program on Atlantic salmon has been established for Little Falls Stream and the Machias and Narraguagus Rivers in Maine. Operations on Little Falls Stream were for the purpose of testing experimental stocking procedures.

Inland Fisheries

Major emphasis in the Great Lakes research program was on developing methods for controlling the parasitic sea lamprey. Activities consisted largely in further testing and refining of electrical barriers, completing certain researches on the biology of the lamprey, and continuing a survey of streams tributary to Lake Superior. Eighteen lamprey electrical-control devices have been installed in streams along the Michigan shore of Lake Superior. Of the 10 in continuous operation since the last of April, 8 took 765 lampreys. The improved Burkey Screen continued to suffer transformer difficulties, but during its operation it killed at least 153 adult lampreys. During the year, five papers were published on the sea lamprey and related Great Lakes problems.

To explain enormous overwinter trout losses in most streams in the United States, native and hatchery trout have been stocked in four experimental stream sections at Convict Creek experimental station in California. Water flow and fish movements can be controlled in these sections, which total a mile in length. Stocking experiments to compare overwinter survival of stream-resident brown trout and hatchery-reared, catchable-size rainbow trout found known losses to be slight for both species.

Research to improve fish-hatchery production and efficiency continued. New drugs and chemicals were tested to develop better prophylactic treatment for hatchery fish and to determine the ability of certain chemical compounds to attract or poison fish. Among fingerling brook trout, terramycin stopped mortalities caused by ulcer disease and furunculosis, while aureomycin had no effect. Treatment of the brook trout with chloramphenicol produced more durable results than treatment with terramycin only. Adding antibiotics to food of normal brook trout has a growth-promoting effect only if the fish are fed at an excessive rate. Identification of several new bacterial fish diseases is being attempted, and control methods are being investigated. Experiments were made to determine the effect of fertilization on the bacterial population of warm-water fishponds. The entire set of blueback-salmon feeding experiments for 1953 appears to be in jeopardy because of a disease outbreak which is suspected of being of a virus origin. Of 2 types of egg incubators tested on a production basis, 1 was selected, and plans are being prepared for constructing it. It will carry eggs and fry to the feeding stage in a tenth of the floor space and use a fifth of the water inflow required for conventional deep troughs. Three potential algaecides are being tested for algae control in rearing ponds. While toxic levels for salmon have been determined, efficacy of the chemicals for controlling algae at levels that fish will tolerate has not been determined.

Marine Fisheries

Research in the Gulf of Mexico has been largely in ecology, with emphasis on red tide, distribution of fish eggs and larval and juvenile fishes, and survival and growth of larval shrimp.

To discover zones of greatest plankton production, conventional silk nets and new all-metal nets are used. Another type of sampling device gives a continuous picture of smaller planktonic elements while the research vessel *Alaska* is under way. A temperature and salinity recorder makes possible the correlation of organism abundance with physical conditions. The general distribution of pigments in the bottom sediments (resulting from decomposition of plants and animals) may be related to currents and to productivity of the areas where they are found.

An important part of the work centers around dissolved organic compounds in sea water and the relations between these and organisms that live in their presence. Ascorbic acid and a rhamnoside have been isolated from sea water and identified. Study of the horizontal and vertical distribution of dissolved proteins and carbohydrates is in progress. A spectrophotometer indicates that certain carbohydrates measured in gulf samples are the same substances as those measured in marsh waters.

Data were collected during the November 1952 outbreak, off western Florida, of red tide, which also killed millions of fish in 1946 and 1947, and which has been ascribed to an excess of the dinoflagellate *Gymnodinium brevis.* These data show that Caloosahatchee River effluents are important agents in such blooms, and that organic content and physical attributes cause such activity. Experimental work in tanks indicates that a mass growth of dinoflagellates, as well as other organisms, requires high light intensity, vitamin B_{12}, and sulphides.

In the Northwest Atlantic, mesh-selectivity experiments are being conducted on the *Albatross III* to test the value of the new mesh-size regulation for protecting smaller sizes of haddock, New England's most important commercial species.

The study of the little-known biology of redfish, second to haddock in commercial importance, indicates that fish stocks of different regions are distinct, with little intermigration and with different growth rates.

Effects of ocean waste disposal on marine fisheries off Delaware Bay are being studied.

The Service, the Scripps Institution of Oceanography, the California Department of Fish and Game, the California Academy of Sciences, and the Hopkins Marine Station of Stanford University, with the support of the industry (through the California Marine Research Committee) continued their study of the Pacific sardine, greatest contributor to the fish catch of the Nation until the sharp decline in abundance after 1944. By determining variations in amount and range of spawning, in current patterns, and in other characteristics of the marine climate off the west coast, they are attempting to determine population size in various years and fluctuation causes.

Sardine spawning off southern California and adjacent Baja California was less than in 1951 and markedly less than in 1950. The spawning center off central Baja California, on the contrary, has increased in relative importance year by year. During 1952, although fewer eggs were collected than during 1951, considerably more larvae were obtained. As in previous seasons, spawning was most abundant in the vicinity of Punta Santa Eugenia.

In the central Pacific, studies continued to provide information on ranges and distribution of the several species of tuna and on their life histories and migrations. Though hampered by bad weather and lack of sufficient quantities of proper-sized bait, pole-and-line fishing with live-bait chum in the vicinity of Palmyra, Fanning, and Christmas Islands yielded about 14 tons of tuna and about 2 tons of reef fishes, a result that demonstrated that the Line Islands have an exploitable resource.

A survey was made of the hydrography, distribution of nutrients, and plankton near the Line Islands. Good catches of tuna at the rate of 14 and 19 per 100 hooks (a day) were obtained.

Longline fishing near the equator to determine variations in abundance of tuna was accomplished between longitudes 120° and 170° W. No spectacular catches were made; the tuna-rich zone yielded 4 to 7 yellowfin per 100 hooks. Along 150° W., longline-fishing success varied from 1½ to 5 yellowfin per 100 hooks, although one cruise indicated a concentration of 11 yellowfin per 100 hooks at about 4° N. latitude. On 140° W. longitude the catch varied from 5 to 17 yellowfin per 100 hooks. Studies thus far indicate several separate and distinct populations of yellowfin in the Pacific. In addition to the yellowfin catch, as many as 5 albacore per 100 hooks were caught on 140° W. longitude south of the equator between 1° and 15°30′ S. latitude.

Live-bait fishing experiments resulted in the conclusion that bait and tuna resources of the Line Islands are sufficient to support a small sampan fishery like that of the Hawaiian Islands. Baiting attempts at various central Pacific islands show the leeward islands of the Hawaiian archipelago to contain promising amounts of bait.

An extensive series of tank and pond trials with chemical tuna attractants was completed and some promising compounds were prepared in quantities sufficient for sea trials. Sea trials of the dispersion of the chemicals and of the reaction of the tunas to the attractants have had largely negative results in the first few tests, but it may be possible to refine techniques further.

Concurrently with vessel operations, United States Navy planes made monthly flights to cover wider areas in less time, and to test results obtained from the vessels. Results indicate close agreement between observations from the plane and those from the vessel. The more precise results are obtained from the boat.

Shellfisheries

Productivity studies to determine how many bushels of hard clams can be removed from Greenwich Bay, R. I., each year without causing depletion, should provide information and methods of value to each State faced with the problem of managing a public clam fishery.

Overdigging is undoubtedly a factor in the scarcity of soft clams on the Atlantic coast, but it is not the principal one, nor has sewage pollution proved lethal. Of 8 soft-clam farms planted in Maine, New Hampshire, and Massachusetts since service clam studies began in 1949, to find out whether farming is the way to increase production, only 1 farm, where predatory green crabs were scarce and horseshoe crabs absent, was successful. Studies show that the warm years may cause an increase in the abundance of green crabs and an extension of their range. Tagging reveals a migration of green crabs offshore during the fall and onto the flats in the spring. Traps are fished to see whether trapping is a usable method of controlling green crabs. An effort is being made to promote their use as fish bait.

Oysters were successfully cultivated in salt-water ponds at Milford, Conn. European oysters, *Ostrea edulis*, have been found to live and propagate under New England conditions.

An inventory was made of Maryland oyster bars in Chesapeake Bay to determine marketable oysters available for present season cropping and smaller oysters available for future crops and current natural recruitment as indicated by the 1952 spatfall survival.

Progress has been made at Pensacola, Fla., in research on problems of oyster cultivation peculiar to the Gulf of Mexico, including oyster growth rates and seasonal reproductive cycles of oyster predators, such as the drill, the boring clam, and the boring sponge.

RESEARCH IN WILDLIFE MANAGEMENT

The Cooperative Wildlife Research Unit program in its 18th year continued to be popular because of its research findings, its technical assistance to conservation agencies, and its contributions to the training of wildlife students and to conservation education. Fish and Wildlife Service expenditures for the program were matched several times over by the cash, supplies, and manpower furnished by the 17 land-grant colleges, 16 State conservation departments, the Alaska Game Commission, and the Wildlife Management Institute, all participating in this cooperative project.

A total of 245 wildlife students graduated from Unit schools in the school year 1951–52. Approximately 13 percent of the graduates went nto military service; most of the rest either returned to college for advanced training or obtained positions in the wildlife field.

More than 150 technical papers, bulletins, and popular articles on research findings were published and distributed during the calendar year 1952. Unit research projects numbered more than 160 and involved work on waterfowl, small and big game, fur animals, wildlife nvironment, and many other phases of wildlife management.

Research in avian botulism, conducted cooperatively with the Mirobiological Institute of the Public Health Service, is producing facts believed significant in combating the malady. Field experiments at he Bear River refuge in Utah and bacteriological studies at Hamilon, Mont., have added information on this highly destructive disease f western waterfowl.

Field tests of a relatively new anticoagulant rodenticide showed hat it was highly effective in the control of commensal rodents, and ad important insecticidal properties. Improvements in synthesis of this compound, 2-pivalyl-1, 3-indandione, reduced its cost one-third. Cereal baits containing the chemical were largely protected from invasion by grain-infesting insects.

Anticoagulant compounds, so important in recent years in rat control, were given field trials in coyote control. Indications are that they can be used to reduce the numbers of coyotes in settled districts with minimum danger to other animals, particularly ranchers' dogs.

A treatment for seeds of certain forest trees and range plants that gives promise of protection against rodent loss has been developed through the cooperative effort of Federal, State, and private forest organizations in 7 States and Canada, directed and coordinated by the Wildlife Research Laboratory at Denver. This seed treatment, suited to such rapid reforestation practices as helicopter broadcasting, should reduce the cost and increase the efficiency of direct seeding.

A forward step in control of orchard mice has been the structural designing and field testing of mechanical devices that create artificial mouse trails into which poison baits are dropped. Not only are control costs reduced, but the baits are deposited where they will be found by the mice and will be out of the reach of beneficial birds.

The search for better rodent repellants for packaging has continued, with emphasis on evaluating materials already found promising. Of 12 compounds appraised in commercially prepared boxes, 3 afforded significant protection against rodent attack. Their use in plastics, electrical insulation, fabrics, and other materials is being investigated under a grant from the Quartermaster Corps and a recent grant from a chemical-manufacturing company.

Studies of forest rodents in the Pacific Northwest are yielding information valuable in the perpetuation of Douglas-fir and ponderosa pine. A study of quail in longleaf-pine areas, involving census, food habits, burning, grazing, and plantings of food and cover, has done much to explain how quail fit into modern practices of forestry and grazing. Special attention has been given such species as beavers, porcupines, snowshoe hares, and pocket gophers, and the problems they create. As usual, data furnished by State game agencies have been compiled into the annual inventory and kill of big game.

With some migratory game birds it will be many years before banding operations give enough information to show the relative importance of certain breeding grounds to certain hunting areas. A quicker, although less definite, method of getting the needed information is being worked on at present in the case of the mourning dove. This requires determination of the region of origin of these birds by the racial identification of wing samples contributed by hunters. Large samples of harvested birds may be obtained in this way, and investigations show considerable promise.

Findings of wildlife-disease studies include improved techniques for cultural diagnosis of *Trichomonas gallinae*, causative agent of trichomoniasis in mourning doves. It has been demonstrated that a virus-induced skin tumor can be transmitted from squirrels to rabbits or woodchucks, and there is evidence that rabbits may be infected in nature with Coxsackie virus, a disease of man related to polio. Cooperation with other agencies in this field includes work with the Bureau of Animal Industry, the National Institutes of Health, and the Office of the Surgeon General.

Research on effects of insect-control operations on beneficial wildlife have continued with emphasis on mosquito-control operations that affect marsh and aquatic habitat. In preliminary tests in cooperation with the New Jersey Agricultural Experiment Station it was found that applications of granular materials impregnated with insecticides are less damaging to fish than oil sprays.

Mosquito control by drainage of surface water through ditching, a method which often destroys valuable marsh habitat and wildlife dependent upon it, has again increased. Drainage destroys wildlife values in marshes, while impoundments improve marsh habitats for waterfowl, muskrats, and fish. To determine the effectiveness of various kinds of impoundments and different types of water manipulation in controlling mosquitoes, a cooperative study has been initiated by the Service, the Bureau of Entomology and Plant Quarantine, the New Jersey Fish and Game Department, the New Jersey Agricultural Experiment Station, and the Delaware Agricultural Experiment Station.

Farms are the most important single habitat for wildlife in America, both game and nongame. How to produce game on the modern, scientifically managed farm is the goal of a project at the Service's Patuxent Research Refuge near Laurel, Md. Two experimental farms there provide a field laboratory for investigating utility and feasibility of incorporating plantings for wildlife into a practical farm operation. These farms now serve State and Federal agencies as demonstration areas for wildlife planning in modern agriculture. Wildlife developments completed include 2.3 miles of living fence, 1.6 miles of field-border plantings, 1.1 miles of contour hedge, an ungrazed 5-acre farm woodlot, several planted waste areas, and a 1-acre farm pond.

The objective of current studies on waterfowl habitat is to compensate in some degree for constantly shrinking living space available to waterfowl. Many marshlands in the United States are dominated by "weed" species that do not provide waterfowl food. Studies are being made to determine how best to replace these with useful plants. Water-level adjustment is proving an important tool for this purpose and some herbicides are also useful. Current information has been summed up for use by wildlife workers in all parts of the country in circular 19, Improving Duck Marshes by Weed Control.

Another step toward best use of remaining habitat is preparation of an inventory of wetlands of this country. Waterfowl-habitat investigators of the Service completed during the year a classification of wetlands. Some 20 types of wetlands are recognized. Each type has been described, rated in its value to wildlife, and located on range maps.

Wildlife Review—a journal of abstracts distributed to over 3,000 Federal and State wildlife biologists and administrators—appeared in an improved format, combining advantages of easier filing, greater durability, and lower cost. Six issues, with some 1,900 entries, appeared; one issue included an indexed list of wildlife publications issued by State game departments.

The fur-seal investigations undertaken jointly by the Governments of Canada, Japan, and the United States have been completed. A report was made on the "Food Habits and Distribution of the Fur Seals of the North Pacific Ocean." The Service is preparing the report for submission to the cooperating governments, after which an approved number of copies will be published.

At the Fur Animal Field Station, at Southwestern Louisiana Institute, Lafayette, La., studies have been inaugurated to determine the effect of marsh-water levels on muskrat populations and to evaluate the role of the introduced nutrias in the ecology of the gulf-coast marshes. The reduction of the muskrat population in this region during the past few years has been attributed by trappers to both drought and the increase of nutrias. The present studies will provide information on these points, and will add to the basic facts required for effective management of the two species.

DEVELOPMENT OF NATIONAL WILDLIFE REFUGES

Acquisition of additional units in the National Wildlife Refuge system is becoming more difficult each year. Continued encroachment into the residual wetlands of the country by activities that discourage waterfowl use, such as agricultural drainage, industrial development, and oil and gas exploration, emphasizes the desirability of an accelerated land-acquisition program. Satisfactory progress has been made in refuge development with practically all operations being financed by proceeds from the $2 duck stamp and refuge receipts.

Construction on the 204,000-acre Stillwater National Wildlife Management Area in western Nevada has now progressed sufficiently to permit some water impoundment and the irrigation of some cropland.

Carson Sink in which this area is located is normally dry, but a lake of nearly 70,000 acres resulted from the 1952 runoff.

Completion of the dike and control structure on the 20,683-acre Horicon National Wildlife Refuge in eastern Wisconsin has permitted the establishment of new water levels, resulting in a marked change in the vegetation of this restored marsh. Waterfowl production and use have reached peak proportions. In addition, fishing has been improved and the muskrat population has soared. Trapping of muskrats reached the peak of 47,739, highest since the refuge was begun, and represents a harvest of about 4 animals for each flooded acre within the refuge.

The control structure, spillway, and dike have been completed on the 21,600-acre Mingo National Wildlife Refuge in southeastern Missouri. Water was first held in the 17,000-acre pool in 1953. This marks the successful restoration of the famous Mingo Swamp.

Development in connection with the 38,750-acre Laguna Atascosa National Wildlife Refuge, a few miles north of Brownsville, Tex., has provided several fresh-water pools used daily by the thousands of redheads wintering in Laguna Madre. These birds were exceeded in numbers only by the quarter million pintails in late October of 1952.

The 141,000-acre Loxahatchee National Wildlife Refuge in southeastern Florida offers one of the best opportunities for waterfowl development along the Atlantic coast. The joint development of this area with the Corps of Army Engineers and the Central and Southern Florida Flood Control Districts will result in an extensive refuge as well as a fishing and hunting area. Work is now starting on the construction of a headquarters. Drainage ditches have been dug for the first unit outside the reservoir to be used for production of cultivated grains.

Development of several refuges along the Atlantic coast has progressed satisfactorily. Construction of two fresh-water pools on the salt marshes of the 6,400-acre Parker River National Wildlife Refuge in Massachusetts has been completed and the units are full. Wild millet, sago pondweed, and smartweed previously planted in the pool areas, though not extensive in area, are producing excellent stands. Construction of dikes to create fresh-water pools within the 12,000 acres of the Brigantine National Wildlife Refuge in New Jersey is well under way. While complete closure of a pool has not yet been possible, partial impoundment has already attracted both geese and ducks. During the fall of 1952, the concentration of Atlantic brant on Reed's Bay reached an all-time peak of 100,000 birds. The number of fresh-water ducks reached a new high on the 13,800-acre Bombay Hook National Wildlife Refuge in Delaware during the fall of 1952; in

December, nearly 38,000 ducks and geese were using the area. When dike construction is completed and the Shearness pool is flooded, additional waterfowl feeding areas will be provided. The two fresh-water pools created during the past 2 years on the 8,800-acre Chincoteague National Wildlife Refuge in Virginia are now producing good stands of marsh and aquatic foods for waterfowl. These shallow impoundments, the result of low dikes, are reasonably permanent and are attracting an increased number of waterfowl.

A diversion channel on the 39,600-acre Necedah National Wildlife Refuge in central Wisconsin permitted putting a 3,000-acre pool into operation in the Sprague-Mather unit. On the 15,000-acre Rice Lake National Wildlife Refuge in eastern Minnesota, a control structure was finished, to impound an additional unit on the Rice River.

On the Bosque del Apache National Wildlife Refuge in New Mexico, 4,000 acres have now been cleared and drained, and irrigated crops have been planted to furnish feed for waterfowl. Construction on the 24,000-acre Bitter Lake National Wildlife Refuge in New Mexico, now completed, included the creation of ponds by diking and channelization of the Pecos River through the refuge area. On the 142,000-acre Sabine National Wildlife Refuge on the Louisiana coast, the third control unit has been completed on unit 3. Diking of this unit will soon be completed, resulting in a fresh-water pool of 16,000 acres.

The Service has encouraged the removal of carp and other rough fish from refuges by commercial fishermen in an effort to improve habitat for waterfowl. Results have been most gratifying. On the 50,178-acre Mattamuskeet National Wildlife Refuge, large numbers of carp formerly destroyed aquatic vegetation and, through their digging and rooting in search of food, increased turbidity to the extent that sunlight could not penetrate the muddy waters sufficiently to sustain plant life. With the removal of over 2 million pounds of these fish during the past several years, lake waters are now comparatively clear, and beds of aquatics are reestablishing themselves. Surplus grain, principally corn, was used to concentrate these fish where they could be seined. The success of this operation at Mattamuskeet has been followed by similar programs on a number of other areas.

During 1952, plant-control operations were conducted on 10,340 acres of undesirable vegetation on 40 refuges. Many of these operations were coordinated with control programs of local agencies and individuals in the vicinity of refuges. This work entailed the use of aircraft, power and hand spraying rigs of various types, and mechanical equipment for the dissemination of chemical herbicides or the cutting or removal of noxious plants. The undesirable vegetation subjected to control included 575 acres of marsh and aquatic plants, 5,000 acres of upland and range weeds—some toxic to livestock—and

2,133 acres of brush and trees, of which 924 acres were willows. Removal of undesirable plants permitted their replacement by plants supplying important food and cover for various types of wildlife.

Legislation was considered by the past two sessions of Congress to authorize the establishment of a wildlife-management area in the Florida Keys for the protection of the key deer. In the meantime, several public organizations, including the Boone and Crockett Club of New York and, more recently, the National Wildlife Federation with headquarters in Washington, have raised money to employ a patrolman to protect this remnant herd. During the nearly 2 years this cooperative program has been under way, an employee of the Fish and Wildlife Service, paid from these cooperative funds, has served as patrolman and has studied the requirements of these animals. In this 2-year period, there was practically no loss of key deer except from speeding automobiles along United States Highway 1. Actually, during this interval, the population increased from about 30 animals to more than 70.

Public use of refuge areas for recreational purposes, which neared the 3½-million-visitor mark in 1951, continued to increase on most areas. On the Wichita Mountains Wildlife Refuge in southwestern Oklahoma, there were 714,978 visitors in 1952. On the 44,000-acre Crab Orchard National Wildlife Refuge in southern Illinois, public use nearly doubled, from 395,132 visitors in 1951 to 648,320 in 1952.

The first unit comprising 2,247 acres has been acquired in the Monte Vista National Wildlife Refuge in Rio Grande County, Colo. The Migratory Bird Conservation Commission has approved purchase of an additional 2,133 acres on which options are held. This is the first successful effort to secure a national wildlife refuge in Colorado where large concentrations of ducks, particularly mallards, have created problems in the important agricultural sections of the State.

The Shiawassee National Wildlife Refuge in Saginaw County, Mich., was authorized by the Migratory Bird Conservation Commission when the initial purchase of 2,246 acres of land for this unit was approved. This refuge will adjoin a unit that the State of Michigan is purchasing for management as a public shooting area.

Presquile National Wildlife Refuge in Chesterfield County, Va., was established on land bequeathed to the Department of the Interior by the late Adolph D. Williams, of Richmond, Va. The refuge contains 1,329 acres on the James River and is so situated that it forms a link in the chain of waterfowl refuges in the Atlantic flyway, being particularly attractive to Canada geese.

TABLE 3.—Land acquired or in process of acquisition for wildlife conservation purposes under the Migratory Bird Conservation Act, by exchange, and by other acts of Congress, fiscal year 1953

[In acres]

State and refuge	Acquired			Pending title conveyance
	By other than purchase	By purchase	Total	
Alaska: Fairbanks		1	1	
Arkansas: Big Lake				161
California:				
Colusa		560	560	
Sutter		850	850	500
Colorado: Monte Vista		2, 247	2, 247	2, 134
Florida:				
Chassahowitzka		424	424	5, 201
Loxahatchee		80	80	2, 432
St. Marks				8
Sanibel				100
Georgia:				
Okefenokee		62	62	
Piedmont	264		264	226
Idaho: Deer Flat				59
Iowa:				
Union Slough		2	2	
Upper Mississippi		62	62	
Kentucky: Kentucky Woodlands		93	93	
Maine: Moosehorn		7	7	31
Maryland: Chincoteague				323
Michigan: Shiawassee				2, 246
Minnesota:				
Rice Lake		40	40	302
Upper Mississippi				465
Mississippi: Noxubee	860		860	1, 923
Missouri: Mingo		23	23	
Nebraska: Fort Niobrara				640
New Jersey:				
Brigantine		653	653	53
Killcohook	2		2	
New York: Wertheim				8
North Dakota:				
Des Lacs				70
Lake Zahl		745	745	
Lostwood				490
Oklahoma: Salt Plains				80
Oregon:				
Cold Springs		152	152	69
Malheur				2, 351
Upper Klamath		4, 387	4, 387	
South Carolina: Carolina Sandhills				51
Texas: Laguna Atascosa				25
Virginia:				
Chincoteague		128	128	25
Presquile				1, 329
Washington:				
Columbia				240
Little Pend Oreille	1, 110	1	1, 111	
Turnbull				680
Willapa				160
Wisconsin:				
Horicon				113
Upper Mississippi				67
Total	2, 236	10, 517	12, 753	22, 562

ADMINISTRATION OF FEDERAL STATUTES FOR PROTECTION OF FISH AND WILDLIFE

The value of a coordinated program for collection of information and subsequent establishment of regulations for the proper management of migratory birds was apparent this year. The technical and law-enforcement staffs have demonstrated that close cooperation can extend their activities and more efficiently handle field assignments.

The enlarged law-enforcement staff as described in the 1952 Annual Report has made an enviable record; apprehensions of violators and penalties for violations increased about 20 percent. Even more important than the increased number of convictions is the improvement in the public attitude and understanding of Federal laws, through closer association between law-enforcement agents and the public.

The Service has worked closely with the States and with the Governments of Canada and Mexico in gathering information to be used in improving waterfowl management. Sound management of waterfowl depends on facts, and getting the necessary facts requires close cooperation of the Federal Service, State game departments, and Provincial and Federal wildlife agencies in Canada.

It was to better meet the need for a cooperative approach in waterfowl investigations that the Service's Branch of Game Management was reorganized in 1952. Each regional office was assigned a waterfowl biologist, and waterfowl biologists were assigned to work with flyway councils, in each of the four waterfowl flyways. These flyway councils, made up of State game administrators, waterfowl biologists, and technical committees, are being developed to plan and work with the Service on approved flyway projects. Through this cooperative approach, more and better management information is now available for each flyway.

Projects were continued to determine where the ducks come from and where they go, to forecast the fall flight each year from the breeding grounds, to appraise the size of the harvest by sportsmen, to conduct winter distribution surveys, and to estimate overall mortality.

In addition to enforcement and investigations, the game-management staff continued to assist and advise farmers on problems arising from depredations to agricultural crops. The Service strives to improve depredation-control methods and to manage the migratory-waterfowl resources so that there is a maximum population with minimum damage to agriculture. Every effort has been made to cooperate with farmers and farm organizations, and the distribution of pamphlets and other materials to aid farmers in depredation control has been continued.

At the end of the fiscal year the following most common migratory-bird permits were outstanding: Propagating, 2,573; scientific collecting, 1,556; scientific possession, 508; bird banding, 3,340. Actions in connection with these permits were as follows: New permits issued, 1,268; renewals, 332; amended, 46; revised, 522; canceled, 225; revoked, 215.

Special permits, valid for specific periods to authorize the use of pyrotechnics, airplanes, and certain firearms, were issued by the regional directors to control migratory birds when causing or about to cause serious injury to agricultural crops or other interests; these totaled 1,828.

During the 1952 calendar year, 10,641 ducks and 1,338 geese were sold by permittees for propagating purposes; 9,233 ducks and 2,911 geese were sold for food; and 11,686 ducks and 2,959 geese were liberated. In the same period, 22,154 wild ducks and 9,594 wild geese (44,338 migratory waterfowl in all) were being reared in captivity. Under the authority of experimental-breeding permits, 394 mourning doves, 42 white-winged doves, and 48 band-tailed pigeons were being reared in captivity. During the year, 14,560 migratory birds, 111 sets of eggs, and 1,766 eggs not in sets were collected for scientific purposes.

The Service continues to check on species destined for cage-bird traffic. There were returned to shippers at points outside the United States a number of indigo and painted buntings, Baltimore and hooded orioles, dickcissels, cardinals, mockingbirds, and phainopeplas, and 42 indigo buntings in a shipment inside the country were liberated.

TABLE 4.—Summary of penalties imposed for violations of wildlife-conservation laws, fiscal year 1953

	Convictions	Fines and costs	Jail sentences
			Days
Migratory Bird Treaty Act [1]	524	$22,766.15	[2] 75
Migratory Bird Conservation Act	59	1,953.50	(3)
Migratory Bird Hunting Stamp Act	51	1,425.00	(4)
Bald Eagle Act	4	5.00	----------
Black Bass Act	3	725.00	59
State laws, cooperative prosecutions	[5] 5,584	161,510.74	134
Total	6,225	188,385.39	268

[1] In the fiscal year, 687 Migratory Bird Treaty Act cases were disposed of as follows: Convictions, 524; dismissals, 19; nol prossed, 32; closed without prosecution, 45; adjudged not guilty, 67.

[2] 4,570 days suspended. [3] 210 days suspended. [4] 240 days suspended.

[5] Includes 3,322 cases relating to the taking of migratory birds and interstate shipments of game animals and game fishes.

In Alaska the Service is responsible for enforcement of the Alaska Game Law, for protection of wild animals, birds, and game fishes. Since a portion of the Pribilof Islands fur-seal receipts were made available for enforcement of the game law and other conservation regulations in the Territory, the Service has been able to extend somewhat its enforcement activities to protect wildlife in the Territory. Enforcement was supplemented in certain areas by the military authorities.

During the year, 297 cases involving violations of the Alaska Game Law were concluded. Fines amounted to $20,572, of which $1,812 was suspended. Jail sentences totaled 3,700 days, of which 2,425 days were suspended. Seizures included pelts of beaver, mink, marten, lynx, otter, fox, and weasel, and hides of 9 caribou, 2 grizzly bears, 1 deer, 1 moose, and 1 goat. Bird seizures included 1 bald eagle. Big-game seizures were as follows: Moose, 15,210 pounds; caribou, 2,120 pounds; goat, 1,000 pounds; sheep, 800 pounds; bear, 800 pounds; deer, 720 pounds.

FEDERAL AID TO STATE PROJECTS FOR THE RESTORATION OF FISH AND WILDLIFE

Wildlife Restoration

Although receipts from the excise tax on sporting arms and ammunition declined from record collections of a year ago, program work reached an all-time high in terms of funds obligated, number of projects, and accomplishments. The carryover of unobligated funds from the preceding year plus the apportionment of $10,145,106 for the current year gave the States a total of $17,821,224.44. By the end of the year 776 projects had been approved for $14,981,419.06. With the 25-percent matching funds that the States contribute, obligations amounted to almost $20 million.

The States continued to stress restoration and improvement of wildlife habitat. In the Southeast plantings of lespedezas for wildlife food and cover continue popular in restoration programs, and multiflora rose for living fence and cover is gaining in favor. Many other States use multiflora rose in their food and cover programs, and all the States seem particularly interested in better site selection, planting operations, and maintenance of established plantings.

Creation of small marshes (1 to 5 acres) on private land, as pioneered by New York, has met with increasing favor by landowners of that State, and several other States have launched similar programs. Of the larger waterfowl areas under construction, Minnesota's 50,000-acre Roseau and Kansas's 18,000-acre Cheyenne Bottoms were near completion. Indiana dedicated Willow Slough in the fall, and Missouri's duck hunters enjoyed the first hunt on the Trimble waterfowl area near St. Joseph.

Developments for forest game on public lands received added emphasis. Worthy of note was the rapid growth in cooperation by owners of large timber holdings in the Southern States. Florida now has 955,300 acres under cooperative agreement where the owners have turned over hunting privileges and development authority to the State. Improvements for forest game include establishment of clearings where perennials were seeded for turkey and deer food. Badly overgrazed big-game ranges in the West were fenced and reseeded. An added feature was establishing rain catchments for watering big game. These, patterned along the lines of those developed for quail and doves, show promise in the arid Southwest.

Trapping and transplanting to stock vacant ranges continued to receive attention, particularly the moving of deer and wild turkey.

Purchase and leasing of lands by the States for wildlife refuges and management areas increased substantially over last year: 116,459 acres were purchased and 200,898 were leased. The purchase figure does not compare favorably with the record—196,615 acres—established in 1950, though land expenditures this year almost equaled those of 1950. Increased prices for lands militated against acquiring a larger acreage.

Waterfowl-marsh acquisition held major attention over much of the country. Many new areas came into being this year, and substantial acreages were added to units started in earlier years. Big-game winter range acquisitions were undertaken at a continuing rate. Several purchases of new areas in Washington, Oregon, New Mexico, and Wyoming were initiated during the year.

The pattern of investigations followed the trend of the past few years, with the bulk of the funds being used to finance needed wildlife inventories. These studies supply data on which to base hunting regulations, and supply the States with data for the management of the waterfowl in each flyway in cooperation with the Fish and Wildlife Service. Investigational projects disclosed cases of underharvest of game with the result that several States now have a two-deer limit per hunter each season. Others have opened the season on does where studies disclosed overused ranges.

Studies of the effectiveness of habitat improvements have received increased attention. The heavy expenditures being made to improve conditions for wildlife must be predicated on sound methods and economic feasibility. Studies were made to determine wildlife utilization, relative efficiency of establishing food and cover by various cultural methods, and the response of landowners where wildlife improvements were made on their land.

During the year, 364 publications resulted from Pittman-Robertson projects. One report, Sage Grouse in Wyoming, was given the Wildlife Society's award as the best terrestrial wildlife publication of the year.

Fish Restoration

To satisfy the demands of more than 17 million license-buying anglers is a tremendous job. Toward its accomplishment, 17 States established Federal aid in fish restoration projects for construction of dams to create new fishing waters. All of these newly formed lakes, averaging over 125 acres in size, will be within easy driving distance of centers where demand for fishing is heavy and angling opportunities are scarce.

Lakes with a combined area of more than 6,500 acres, containing unbalanced or undesirable fish populations, were given corrective fish-poisoning treatment, in 13 projects. Notable among these projects is Oregon's program to rehabilitate the rainbow-trout fishery of 3,000-acre Diamond Lake. When the removal and restocking job is completed, this mountain lake may once again be noted for its splendid production of rainbow trout.

Waterhyacinth, an ornamental plant from the Orient, has spread a suffocating blanket over some of the finest fishing waters in the South. Florida, Louisiana, and Texas had projects approved for spraying with 2,4–D compounds to kill off this noxious plant.

Removal of log jams and rock barriers that prevent salmon and steelhead trout from utilizing the upper reaches of spawning streams is sometimes essential to maintain stocks of migratory fishes. Rehabilitation investments, as illustrated by work on California's north-oast streams, are sure to return generous dividends in the form of increased runs of these highly prized fishes.

The year witnessed a sharp increase in the number of projects to reate new fishing waters and to improve environments; 49 such resto-ation projects were approved. Work outlined in them called for the xpenditure of $1,265,042.97 or 40 percent of the funds obligated by he States on program work during the year.

Several of the States are using substantial parts of their fish-estoration funds to buy essential frontages on lakes and streams and re constructing roads and parking areas to ensure access and use y the public. Fifty-three acquisition projects to obtain control of ey access sites and to provide areas for the impoundment of new akes were begun by the States. More than 2,500 acres of land were cquired through these purchases.

The constantly increasing pressure on the sport-fish resource calls or the most skillful management. Facts about the size of fish popu-ations, the kinds present, rates of growth, mortality, and angler arvest are all necessary for effective management. Several States ontinued studies of the effectiveness of stocking fish under a variety f conditions, and progress was made in finding ways to improve fish-ultural practices.

Farm fish ponds, now numbering more than a million, supply much xcellent angling. There is a dearth of good management informa-ion over much of the country to guide pond owners. Studies have een undertaken by five States to gather urgently needed facts. The nvestigations consist in testing various stocking ratios, trying out different fish species, ascertaining rates of growth and reproduction, and keeping track of the harvest. Seven projects in five States dealt with the sport-fish resources of our coastal waters.

The first issue of a report to be known as the Dingell-Johnson Quarterly, designed to report on current findings and program status, was prepared and ready for printing at the close of the fiscal year. A 133-page circular, Survey of Fishery Activities, 1953, was made available to more than 80 agencies and institutions engaged in sport-fishery activities.

For the year, the sum of $2,628,527 was allotted to the 48 States, Alaska, Hawaii, Puerto Rico, and the Virgin Islands to defray costs of the Federal share of fish-restoration projects selected by them. In all, 261 projects were approved during the year and $3,160,045.13 was obligated on them. Unobligated funds carried over from the preceding year accounted for the difference between the amount apportioned to program participants for the year and the total obligated.

CONTROLLING DAMAGE BY ANIMALS

Control activities of the Service include protection of livestock, poultry, and game from losses by coyotes and other predators; prevention of rodent or rabbit damage to growing crops, including timber; reduction of rat and mouse damage to stored foods and feeds; and control of wild animals that carry diseases such as rabies or bubonic plague. About four-fifths of the cost is borne by industries or areas affected, through three-way cooperation between the Federal, State, and local governments, and private industry.

An example of economic benefits from such cooperation is found in the Idaho program, where $102,000 of cooperative funds were spent last year for predator control. The lambs saved by this work were estimated by agricultural officials to be worth over four times that amount, or about $450,000. Added to this were benefits to poultry, game, and fur animals. In the Caribou National Forest, where about 15 percent of Idaho's sheep graze, modern control methods in the last few years have cut predator losses in half. In Arkansas there has been a 50-percent reduction in wolf depredations since organized control was begun 4 years ago. In California, turkey raising has increased since coyote control reduced losses to a minimum. Only 10 turkeys were reported killed by predators this year among 600,000 birds raised in Tuolumne County. An advisory committee on predator control in Montana states that the cooperative program there has probably been the greatest single benefit that has ever happened to the sheep industry, and has also been the largest single factor in the rapid increase in game animals. In Alaska a reduction of about 60 percent in the number of wolves harassing an Arctic caribou herd of some 12,000 animals resulted in an increase of more than 100 percent in the calf crop of this important game and food source.

International cooperation was continued with the Mexican Government through the Pan American Sanitary Bureau on predator-control demonstrations in Baja California Norte, and through direct negotiations with Yukon Territory and several Canadian Provinces. The Mexican program, begun in Chihuahua and Sonora 3 years ago, has reduced the invasions of predators into the United States. The period July–December 1953 was the first 6-month interval without capture of a single wolf in southern New Mexico.

Slight increases in coyote numbers have been reported throughout the West and may be partially due to decreasing effectiveness of compound 1080 as a control agent. At the same time there have been local upward trends in populations of rabbits and rodents with no apparent relation to numbers of predators. Preceding and accompanying the slight coyote increase there has been a more noticeable upswing in bobcat numbers. There are some increases in black bears, although an opposite trend is reported in Colorado.

Along the northern Pacific coast, bear damage through slashing of the bark of young trees is becoming locally severe. In Humboldt County, Calif., 54 of these animals were taken in the first half of this year, after much damage had been done to young redwoods. Heavy damage resulted in establishment of a continuous open season on bears in all western counties of Washington, and bears were designated as predators in the five Olympic Peninsula counties.

Aid in suppressing rabies, through control of infected foxes and other wildlife carriers, has continued to the extent of Service facilities and cooperator support. The situation remains critical in many areas. Public sentiment for rabies suppression is seldom sufficient to support an action program until the disease has caused much livestock loss and even human death. The control of rabid wildlife is too often limited to specific neighborhoods or counties. An exception is in Georgia, where the State has recently made a cooperative agreement with the Service for statewide demonstrations and aid in fox control.

Large populations of rodents continued to be an acute problem on much of the 25 million acres of irrigated cropland where pest animals were attracted from surrounding arid regions by green vegetation and abundant water. This was particularly true in many Western States where jackrabbit concentrations reached surprising proportions; for instance, as many as 3,500 jackrabbits were killed near a small alfalfa field of 80 acres. During the year, local situations of this nature were encountered in Idaho, Nevada, Arizona, and the

Plains States. Somewhat similar problems developed from pocket-gopher infestations in districts where damage occurred not only to crops but also to water structures. Annual pocket-gopher projects are often necessary to keep damage at a minimum.

Two other species of field rodents, pine and meadow mice, are the most abundant and universally destructive forms of native mammals in the country. Orchards are particularly favorable to their increase, and preventing damage to trunks and roots of fruit trees now ranks as the No. 1 problem confronting growers in many areas. Efforts to control these mice through ground application of new insecticides, such as toxaphene, have somewhat reduced mouse numbers under certain conditions. Unfortunately, the procedure requires heavy dosages of the chemical and involves a hazard to domestic animals and wildlife. The Service has discouraged the practice and is concentrating its efforts on more selective techniques. Field trials during the year resulted in development of a mechanical trail builder and poison-grain applicator that gives promise as an improved, economical method of combating these pests.

Timberlands suffer from damage by mice and numerous other rodent species. Assistance in reducing these rodents was given during the year, but such effort must be expanded greatly if satisfactory reforestation is to be attained. Although generally considered quite harmless, porcupines at times create severe losses to commercial timber and sugar-maple plantations in Northeastern States, Lake States, and mountainous regions of the West. Damage was acute last year on Harney National Forest in the Black Hills of South Dakota, and loss there was estimated by forest officials to exceed that caused by both fire and insects. Other forest regions, particularly in Montana, suffered severe local damage to conifer seed production through depredations by red squirrels.

Although total numbers of rats and house mice have been declining, damage caused by them continues to cost the Nation millions of dollars. Losses have been particularly apparent in the grain-handling industry, where huge quantities of wheat are rendered unfit for milling, because of rodent filth. Approximately 40 carloads of such contaminated grain were seized by food inspectors during the past year. Intensified efforts to control rats around mills and country elevators have partially reduced the rodent problem at such establishments. However, little progress has been made in preventing similar contamination on the farm. Suspension of enforcement phases of the grain-sanitation program late in the year meant reduced efforts to combat rat and mouse infestations. The goal of clean grain for food remains an ideal yet to be realized.

The recorded catch of predatory animals included 55,000 coyotes, 1,862 wolves, 18,905 bobcats and lynxes, 729 stock-killing bears, and

184 mountain lions. In rodent-control operations 9,137,978 acres of land were treated for the elimination of prairie dogs, ground squirrels, pocket gophers, jackrabbits, field mice, cotton rats, kangaroo rats, porcupines, woodchucks, and moles. In addition, 372,714 premises were treated in cooperative campaigns for the control of rats. Special equipment and supplies used in predator and rodent control, and 293,115 pounds of rodent-bait materials were distributed to cooperators throughout the country by the supply depot at Pocatello, Idaho.

RIVER BASIN DEVELOPMENT AND WILDLIFE NEEDS

Of 182 reports this year by the Service on water developments planned by Federal agencies or private interests under Federal permit, 92 were on Corps of Engineers projects, 35 on Bureau of Reclamation, 7 on Department of Agriculture, and 48 on power projects requiring license from the Federal Power Commission. In addition, two special reports were prepared, one on the effects on fish and wildlife of a plan of the Rogue Valley Irrigation Association for development of the Rogue River in Oregon, and the other on the relation of fish and wildlife resources to development of the Delaware River which is being studied by the Commonwealth of Pennsylvania.

As a result of conferences with the Service, the Bureau of Reclamation and the Corps of Engineers have instructed their field offices to include in project reports the substance of views of the Fish and Wildlife Service along with comments of the reporting officers on Service recommendations. This will facilitate coordination with those agencies.

The Service continued to participate in the comprehensive investigations of the Arkansas-White-Red River Basin and of the New England-New York area, conducted pursuant to the Flood Control Act of 1950. Fish and wildlife inventories in both regions were completed; reports were prepared on fish and wildlife needs, together with plans for satisfying those needs; and comments were prepared on the effects on fish and wildlife of plans of other agencies.

Service recommendations for the preservation of fish and wildlife resources have been included in various project plans of Federal agencies and in many licenses issued by the Federal Power Commission. These provisions include maintenance of minimum flows below dams; regulation of releases from project reservoirs at as uniform a rate as practicable; maintenance of minimum pools in reservoirs; clearing of reservoir sites on a selective basis; construction, operation, and maintenance of fish-passage facilities; measures to prevent the stranding of fish in stagnant pools; installation of deer-escape ramps in project canals; development of compensatory wildlife habitat; making project lands available to the States for management of the fish and wildlife resources; and the allowance of free public access, to a reasonable extent, to project lands and waters for hunting and fishing.

At the request of the Service, the Corps of Engineers has made provision for a control gate in the railroad embankment across the Snake Creek Arm of the Garrison Reservoir in North Dakota. Installation of the gate, scheduled for 1955, will permit control of water levels in the 26,000-acre Snake Creek area and enable the Service and the North Dakota Game and Fish Department to develop and operate a joint refuge-management area for waterfowl.

In connection with Departmental planning for comprehensive development of the Rogue River in Oregon, the Service conducted creel censuses and investigated the spawning distribution of chinook and silver salmon and steelhead trout. The relative importance of various streams in the watershed for spawning of these species is now known.

Development of wildlife habitat at newly constructed reservoirs has progressed during the year at Swanson Lake and Enders Reservoirs in Nebraska, Canyon Ferry in Montana, and Heart Butte in North Dakota. The program, designed to reduce wildlife losses resulting from inundation of essential habitat, will be extended to other multiple-purpose reservoirs under plans now being prepared.

Of continuing concern is the drainage of water areas for agriculture in the important waterfowl nesting grounds of the prairie pothole region in the Dakotas and Minnesota. Special studies to determine how waterfowl production can continue harmoniously with agricultural programs in these States are nearing completion. It is expected that the Departments of Agriculture and the Interior will jointly consider the findings and formulate policies to maintain waterfowl values in the conduct of Federally assisted agricultural drainage programs.

GEOLOGICAL SURVEY

W. E. Wrather, Director

The ensuing report deals almost exclusively with the accomplishments during fiscal year 1953 of the four technical divisions of the Geological Survey. It does not stress the internal administrative organization which furnishes the facilities for the orderly prosecution of the program. Needless to say, continuing effort is devoted to improvement in administrative procedure to attain greater efficiency and economy.

In fiscal year 1953 the Geological Survey organized an administrative division to facilitate the work of the four professional operating divisions. The Administrative Division, through its functions in the management of personnel, budget, accounts, space control, and other essential supporting activities, will enable the operating divisions to pursue their scientific and technical objectives more effectively.

GEOLOGIC DIVISION

During fiscal year 1953 the Geologic Division continued its study of the geologic structure of the United States and of the Nation's mineral resources. Working with other Government agencies, the Division placed the skills of its geologists and associated scientists at the disposal of a Nation that is becoming increasingly concerned about its supply of natural resources and that must develop these resources both for present and future welfare and defense. Survey geologists continued to bear great responsibility for implementing the programs of the Defense Minerals Exploration Administration and the Defense Materials Procurement Agency; to assign personnel for geologic investigations of mineral resources in underdeveloped countries, under he Mutual Security Act; and to serve as advisers and consultants to he National Security Resources Board, the National Science Foundaion, and the Department of Defense.

The trend toward applying laboratory and airborne methods to mineral exploration continued. Photogeologic techniques were refined and their use as an important aid in geologic mapping reached the applied stage; the acquisition of a second airplane for geophysical exploration increased the scope of airborne magnetometer and radiometric investigations; the completion of a mobile spectrochemical laboratory has widened the use of geochemical methods for detecting in the field minute amounts of significant trace elements that might be indicators of new areas of potential ore bodies.

The demands of national defense have continued to result in some expansion of plant and personnel, but the existing resources of the Survey had already been strained by these needs and its regular program is further retarded. In view of the concern about mineral resources for future use it is most important that the Survey be enabled to continue its carefully planned long-range program of research and geologic mapping, which provide indispensable data.

Mineral Deposits

The work of the Mineral Deposits Branch is to accumulate basic geologic data, through geologic mapping and field and related laboratory studies, necessary for the most effective exploration and development of the Nation's mineral resources, to interpret these data, and to maintain a continuing appraisal of the resources.

Field work was carried out on 86 projects in 36 States. Exploratory drilling was continued in the Iowa-Wisconsin lead-zinc district, in the Mojave Desert, and on the Colorado Plateau. Two geochemical prospecting projects developed field methods for determining minute amounts of antimony, arsenic, barium, and manganese in soils and rocks. Regional mineral-resource studies were continued by projects sponsored by the New England-New York Inter-Agency Committee and the Arkansas, White, Red Rivers Inter-Agency Committee. Financed by the Defense Minerals Exploration Administration and the Defense Materials Procurement Agency, Survey geologists continued, in cooperation with engineers of the Bureau of Mines, to evaluate applications for loans to private owners and to provide the technical advice needed in the enforcement of the contracts.

Several important discoveries resulted from field investigations. A byproduct of the long-term geologic mapping program in the Black Hills, S. Dak., was the discovery of a beryl deposit that produced 250 tons of beryl in fiscal year 1953, representing close to 40 percent of the total domestic production for that period. A bed of low-grade phosphate rock, widespread and as much as 12.5 feet in thickness, was discovered through detailed geologic mapping in the Idaho-

Wyoming phosphate region. Geologic mapping and subsequent exploration by diamond drilling in the Shasta copper belt, California, revealed a large block of mineralized ground containing a significant quantity of copper and zinc sulfides. Field work in the Cuyuna iron range of Minnesota, coupled with the development in the laboratory of a new technique adaptable to field use, led to the development of a method of distinguishing between similar-appearing hanging wall and footwall slates on the basis of a rapid field chemical test for the alumina-titania ratio. If found to be reliable, this method can be expected to reduce the number of drill holes necessary for new iron-ore exploration by perhaps 30 percent. Intensive detailed geologic studies in the Central City district of Colorado resulted in two potentially important discoveries of radioactive deposits. Physical exploration and geologic studies on behalf of the Atomic Energy Commission were continued on the Colorado Plateau; new deposits of significant size were discovered, and the known reserves of other deposits were enlarged.

In the year, 137 manuscripts dealing with minerals investigations were prepared for publication. Of these, 2 were published as professional papers, 13 as bulletins, 21 as circulars, 6 as geologic quadrangle maps, and 3 as mineral investigation maps; 81 were placed on open file, 2 issued by cooperating States, and 9 appeared as articles in scientific journals. In addition, a comprehensive report on the iron-ore reserves of the United States was presented at the International Geological Congress in Algiers, and 77 abstracts were prepared.

Petroleum and Natural Gas

The Geological Survey aids in the search for petroleum and natural gas by developing data about the nature, distribution, and structure of potential oil-bearing rocks. Such data are obtained by detailed geologic mapping and stratigraphic studies, by laboratory studies of well samples, and by the systematic collection and analysis of records obtained from drilling operations.

Twenty-two regional studies were carried on in 16 known or potential oil-bearing States. These studies were selected after consultation with the oil and gas industry, the State geological surveys, and other agencies. Eleven oil and gas maps and charts and two open-file reports were released during the year to provide information on the results of these studies. The new publications include an oil and gas map of Montana, showing oil and gas fields, locations of test wells and anticlinal axes, and a new geologic map of Wyoming, showing the nature, distribution, and structure of the surface rocks in the State.

Coal

The Geological Survey continued detailed mapping of coal beds and intervening rocks in selected coal-bearing areas, and continued to classify and estimate the reserves of coal that are available for present and future use. The work is aided and supported by parallel laboratory studies of the botanical and petrographic constituents of the coal, which provide the background data necessary for a proper understanding of the origin and correlation of the beds, and the effective utilization of the coal.

Investigations of coal were made in 17 States. Summary reappraisals of the reserves of Virginia, North Dakota, South Dakota, and Colorado were published, together with five additional detailed reports of smaller areas.

A reconnaissance search for coals containing radioactive materials and some detailed studies were made in 17 States on behalf of the Atomic Energy Commission. Some of the detailed studies were accompanied by core drilling to obtain information on the subsurface distribution of radioactive coals. Field investigations were supplemented by laboratory studies at the Coal Geology Laboratory in Columbus, Ohio.

Oil Shale

High-grade oil shale deposits in Colorado and Utah were investigated during the year, and 2 reports covering about 635 square miles were completed for publication. It is estimated that the shale in the mapped areas is capable of yielding 79 billion barrels of oil.

Investigations of radioactive oil shale in the Southeastern States were continued during the year under the sponsorship of the Atomic Energy Commission, and a report on the origin of the shale was placed in open file.

Engineering Geology

General service geologic mapping was continued. Greatest emphasis was placed on the mapping of large urban or rural areas in order to provide maximum geologic information for use in the early planning stages of engineering construction projects. The work is all a part of the long-range program of mapping the geology of the United States, but the areas investigated in river basins under development by the Department of the Interior are selected according to the needs of the participating Federal agencies. These geologic data have a multitude of practical uses in the planning of engineering, agricultural, or other activities, and will continue to prove useful long after the present developments have been achieved.

Detailed mapping was completed on two projects in the Missouri River basin. Field work was continued on other projects in the Missouri River basin, the Columbia River basin, and on the upper part of the Green River. Geologic mapping continued in Massachusetts and Rhode Island under cooperative agreements with those States. Also in progress were detailed engineering geologic investigations in expanding urban areas including the San Francisco Bay area, Los Angeles, Omaha, Knoxville, Denver, and Seattle. Research on general and specific landslide problems was continued, and the Survey contributed heavily to the work of the Committee on Landslide Investigations, Highway Research Board, which is preparing a report on landslides and engineering practice.

Among special byproducts of the basic mapping during the year were money-saving services to other Government agencies, such as a report on the ground-water conditions of Angel Island in San Francisco Bay (prepared in cooperation with the Ground Water Branch), and an investigation of landslides and relocation of roads and tunnels near Mesa Verde, Colo., for the National Park Service.

Nineteen field projects were in progress in 11 States. Thirty-three reports and geologic maps were made available to the public through open files in Washington, D. C., and Denver, Colo.; five reports were published as geologic quadrangle maps; one report was issued as a circular; and eighteen abstracts and articles were published in professional journals.

General Geology

Study of basic geologic processes leads to the development of new geologic concepts and techniques for exploration of mineral resources, and general geologic mapping often leads to the discovery of valuable deposits whose existence was not previously known. That part of the Survey's research and mapping which is concerned primarily with topical and broad regional studies not directly related to known mineral deposits or to specialized fields such as geochemistry, geophysics, or paleontology, is for convenience identified as general geology.

In the fiscal year, work was in progress on 20 projects in 17 States, the Aleutian Islands, and the Territory of Hawaii, and 84 photogeologic maps covering areas in the western United States were placed in open file. The Hawaiian and Aleutian projects are concerned chiefly with the study of volcanic processes, although the Aleutian project includes strategic terrain studies for the armed services.

During the year three volcanic eruptions occurred in the areas under study. The outburst of Kilauea volcano on Hawaii lasted from June to November 1952, and was studied in great detail by the staff of the Survey's year-round observatory on that island. In February 1953 Trident volcano, in Katmai National Monument, Alaska, erupted for the first time in recorded history, and activity was still continuing at the end of June. This eruption was viewed intermittently from the air, as weather permitted, during the spring, and will be visited on the ground this summer. In May 1953 a mild eruption of Great Sitkin volcano was reported by the Survey's geophysical station on Adak in the Aleutian Islands.

Geophysics

Airborne surveys, both magnetic and radioactivity, were made in 15 States during fiscal year 1953. New areas of above-normal radioactivity were discovered in Wyoming, Arizona, and Florida. Other investigations of particular significance were the aeromagnetic surveys from Indiana across the southern Appalachians to the Atlantic coastline, and a radioactivity survey along the Atlantic shore from Virginia to Florida.

A C–47 airplane was obtained on loan from the Department of Defense and is being refitted for airborne geophysical work, particularly radiometric reconnaissance for new sources of uranium.

Ground surveys, by one or more of the standard gravity, magnetic, seismic, or electrical methods, were made in 10 States, in Alaska and in 3 areas outside continental United States to obtain data on subsurface structure or stratigraphy in investigations of mineral deposits and water supplies, and in engineering studies. New deposits of manganese-bearing rock were found in the Aroostook area, Maine, as the result of ground magnetic delineation of aeromagnetic anomalies.

Geothermal investigations in Arctic regions were continued. Special equipment was developed for the determination of thermal conductivity of frozen materials, both in the field and laboratory; and a program of systematic measurements was begun.

Theoretical studies of electrical resistivity anomalies were undertaken to aid in the interpretation of data accumulated in field surveys in the Badger-Peacock mining district of Kansas.

As a part of the program undertaken for the Atomic Energy Commission, a variety of projects was carried out. They included geophysical exploration surveys, maintenance and development of radiation-detecting equipment, investigations of radon in the helium-bearing natural-gas fields, and studies of the physical and chemical properties of both ore and country rock where the interstitial water has not been affected by the flushing action of a water-circulating drilling medium. The basic data provided by the last project will be of material assistance in interpreting geologic and geophysical data now available and may suggest new or modified techniques of exploration.

Geophysical Abstracts, a quarterly journal of abstracts of current literature on geophysics and geophysical exploration, began its 25th year of publication.

Geochemistry and Petrology

Specialists of the Geochemistry and Petrology Branch determine the chemical and mineralogic composition and structure of rocks, ores, and minerals as a vital part of the Survey's program of geologic mapping and mineral resources investigations. Skills in mineralogy, petrology, chemistry, and physics, and elaborate laboratory facilities, are required to supply this service. More than 50,000 samples of rocks, ores, minerals, and waters were examined during the year.

Special studies included improvement of analytical methods; continuing development of rapid chemical procedures and methods for geochemical prospecting; completion of a mobile spectrochemical laboratory; geochemistry of niobium and germanium; radio-chemical techniques for determining members of the thorium and uranium series in natural materials; radioactivity methods for determining the geologic age of igneous rocks; and the geochemistry and mineralogy of uranium ores.

The sedimentary petrology laboratory established during the fiscal year in the Washington area has already made an important contribution to the problem of the disposal of radioactive waste material. A laboratory was also established for the determination of the age of materials by the radioactive carbon isotope method.

Fifty-seven reports of investigations were completed for publication during the year.

Paleontology and Stratigraphy

Specialists of the Paleontology and Stratigraphy Branch continued to provide data and concepts essential to the solution of problems in applied geology through research in the succession and relationships of life and sedimentary rocks throughout time. These geologists determine the age, ecologic implications, and biologic affinities of fossils referred for study; and help other Federal geologists with field problems in stratigraphy.

More than 60,000 fossil specimens were studied in the preparation of 540 reports on referred collections from 32 States, Alaska, and 21 other areas. Special studies included efforts to establish criteria for correlation of oil-bearing zones in the Williston basin area of the Dakotas and Montana; the determination on paleobotanical evidence of the Cretaceous-Tertiary boundary in the Hiawatha gas field of Wyoming and Colorado which provided the Conservation Division with information needed to settle an important royalty problem; work in support of strategic studies, the fissionable materials program, and investigations in the Mojave Desert.

One hundred reports of investigations were prepared for publication and of these, 50 were published and 2 were placed on open file.

Geologic Investigations in Alaska

During the year the Alaskan Geology Branch was established to plan and execute more effectively the diverse Alaskan geologic investigations. The new Branch continued work directed toward the discovery and appraisal of the mineral resources of the Territory, with emphasis on fuel resources for internal consumption and possible export, on the strategic and critical minerals needed for military and civilian purposes, and on the study of construction materials used in military, railroad, and highway developments in the Territory.

Coal continued to be a critical mineral commodity problem within the Territory, and studies were made in the Nenana coal field on the north side of the Alaska Range, on the north side of the Little Susitna River (west of Palmer), and in the Matanuska coal field. As a result of these studies, estimates of inferred coal reserves in the Alaska Railroad belt were increased by several million tons, part of which can be strip mined.

Specific investigations included appraisal of petroleum possibilities in the Nelchina area, northeast of Anchorage, near the northeast end of the Cook Inlet-Susitna Mesozoic province, in the Gulf of Alaska Tertiary province, and in northern Alaska (largely financed by Navy funds); reconnaissance mapping of areas in the lower Kuskokwim region; study of copper mineralization in the Prince William Sound area as a long-term field study supplemented by photogeology techniques; detailed studies of tin deposits in the western part of the Seward Peninsula; examination of areas containing scheelite mineralization in the Nome area; studies of 2 perlite and 2 diatomite deposits in McKinley Park; detailed mapping of 2 potential power sites on the Kenai Peninsula; photogeologic mapping in the Prince William Sound area; and reconnaissance surveys for fissionable materials in various parts of the Territory, contributory to which a radiometric laboratory was maintained during the prospecting season at College, Alaska. In the fiscal year, 1 professional paper, 13 circulars, and 18 open-file reports on Alaska were made available to the public.

Military Geology

The Military Geology Branch, under a cooperative agreement between the Department of the Interior and the Department of Defense, provided special geologic advice to the Armed Forces for the 11th consecutive year.

The major activities of the Branch derive from needs of the Engineer Intelligence Division, Office of the Chief of Engineers.

Twenty-eight comprehensive military geology studies and more than 100 shorter contributions dealing with special topics were completed during the past year by the research staff in Washington. Field mapping was carried out on Guam, and a reconnaissance field study was made on Rota to determine the feasibility of and approach to future detailed mapping. Writing was continued on reports on the previously mapped islands of Okinawa, Saipan, Tinian, the Palaus, the Marshalls, and Yap. In Alaska, field surveys of surficial geology were completed on the Kobuk River in northwestern Alaska, in the Tok-Mentasta Pass area along the Glenn Highway in eastern Alaska, and in the Delta River area of central Alaska. Mapping activity continued in the southwestern Copper River basin, and new reconnaissance was begun in the Bristol Bay area, in the central Kenai Peninsula, and along the projected route of a new highway from Paxson, Alaska, to McKinley Park. Reports are in preparation on previously mapped areas of Seward Peninsula, Kenai Peninsula, Delta River, Yukon Flats, and Bristol Bay.

A growing realization of the importance of geologic factors in construction has resulted in many requests for geologic examinations from various defense agencies. Branch geologists, during the past 2 years, have performed engineering geology studies at several military establishments in the United States and abroad; and in the spring of 1953, a group was sent to Greenland at the request of the Corps of Engineers and the Transportation Corps. It is expected that investigative activities of this nature will be continued and expanded.

Foreign Geologic Investigations

The Geological Survey's foreign mineral resources studies began in 1941 under the Interdepartmental Committee on Scientific and Cultural Cooperation with the American Republics and have continued under the sponsorship of the Technical Cooperation Administration of the Department of State and the Mutual Security Agency. During 1953 geological investigations were in progress in Mexico, South America, the Near East, and Asia. In some countries Survey geologists worked closely with geologists from the host country and their findings were published under joint authorship.

In Mexico, Peru, and Brazil the long-range mineral resources studies were continued in cooperation with government geologists from those countries. A geologic reconnaissance of reported phosphate deposits of Bolivia was made in cooperation with the Corporación Boliviana de Fomento. A general reconnaissance assessment of the mineral potential, in terms of point 4 aid, of Colombia and Ecuador was begun in cooperation with the Servicio Geologico Nacional and the Department of Mines, respectively. A reconnaissance study of the geology and mineral deposits of Paraguay and technical assistance in the establishment of the Departmento de Geologia del Paraguay was completed during the year in cooperation with officials of the Ministerio de Obras Publicas y Communicaciones. One Survey geologist continued work in cooperation with officials of the Corporación de Fomento del Chile in their effort to establish a Chilean geological survey and to initiate a countrywide minerals investigation and development program. A geologic reconnaissance of northwestern Saudi Arabia was completed as one phase of the Geological Survey's minerals ground-water project which is continuing in cooperation with the Saudi Arabian Government. A reconnaissance evaluation of reported occurrences of metallic mineral deposits of Iraq, Iran, and Burma was completed in cooperation with mineral-resource agencies of those governments. One geologist continued as technical adviser to the Geological Survey of India in its field investigations of manganese and other mineral deposits. In the Philippines the Survey joined with the United States Bureau of Mines and the Philippine Bureau of Mines in a long-range program of minerals and fuels investigation and development.

A total of 40 promising young technicians, leaders, and specialists in the fields of mineral investigations and supporting sciences received on-the-job training in the Survey's domestic field program. These technicians, from the Philippines, Mexico, Peru, India, Colombia, Brazil, Burma, Thailand, Greece, and Egypt, received not only training in the technical aspects of the work, but also a thorough review of the Survey's administrative practices and organization procedures in long-range planning for countrywide geological surveys.

Geologic Maps

The Office of Geologic Cartography, in conjunction with the 4 field units, prepared 1,768 geologic maps, charts, diagrams, and other illustrations, many of them for multicolor reproduction. Final copy for 8 maps in the geologic quadrangle series, 4 mineral investigations maps, 19 fuels maps, 12 geophysics maps, and 1 State index map were transmitted to the Map Reproduction Branch. Seventy other multicolor maps are in various stages of preparation.

The geologic-map editor reviewed and edited 2,991 maps and other illustrations, involving 243 reports. About 88 percent of these illustrations were designated for publication by the Geological Survey; the rest were sent to cooperating State and Federal agencies and scientific journals for publication.

Library

The Geological Survey library had one of the busiest years in its history. About 24,000 items were added to the main library in Washington, including 2,200 maps and charts. Spot-check estimates indicate that the circulation of books and maps was of record proportions.

Arrangements were made to add considerably to the material in the branches in Denver and San Francisco and a large amount of library material has been made available to the Geological Survey's Spokane office. Loans to field projects increased and improvements were made in this type of service.

Progress was made in the preparation of the cumulative volume for 1941–50 of the Bibliography of North American Geology. The photo library had increased use by both Survey geologists and the public.

TOPOGRAPHIC DIVISION

The preparation of the quadrangle maps that make up the national topographic map series is the major responsibility of the Division. Since it was created in 1879, the Geological Survey has published about 15,000 different topographic atlas sheets which cover about 67 percent of the area of continental United States. Many of the older maps were made to meet less stringent requirements than those existing today and therefore are of limited use. A few of them, in fact, have been withdrawn from distribution. However, about 30 percent of the total area of the 48 States is covered by topographic maps of good quality.

During the fiscal year ending June 30, 1953, there were 1,324 quadrangle maps transmitted to the Publications Office for printing and distribution. Of these maps, 894 represented new mapping by the Geological Survey, 104 were Geological Survey revisions of existing maps, and 103 were new maps compiled by other agencies and, by ineragency agreement, published and distributed by the Geological Survey. The remaining 223 were civil editions of maps which had been previously compiled and published for military use by the Department of Defense. The total area covered by this year's new mapping is about 3 percent of the total area of continental United States. At this rate, it will take about 25 years to complete the mapping of the 48 States.

The Federal mapping program continued to be directed toward national defense requirements, and the greater part of the productive capacity of the Division was utilized to meet the immediate map needs outlined by the Department of Defense. The 6-year program for mapping of strategic areas, begun by the Division in fiscal year 1951, was further expanded in keeping with additional priority requests received from the Department of Defense and with program adjustments effected in conference with military officials.

Mapping capacity in the regional offices, which are at Arlington, Va., Rolla, Mo., Denver, Colo., and Sacramento, Calif., continued to expand in order to meet demands for increased production. The average man-years of work performed by permanent employees in the regional offices increased from 1,922 to 2,004, about 4 percent. Double-shift and overtime operations were continued in these offices as means of increasing both production capacity and the utilization of stereoplotting equipment. Map compilation, including revision, in continental United States increased 18 percent over last year's production—83,100 square miles against 63,500 for fiscal year 1952.

Contracts for topographic-mapping services, awarded to commercial mapmaking companies during the preceding fiscal year, are progressing according to schedule. Of the 16,000 square miles of such mapping under contract, about 6,000 square miles were completed during the year. This imposed a substantial workload of inspection and testing in order to assure compliance with specifications by the contractors.

Technical assistance was extended to other nations through agencies concerned with international cooperation under the Mutual Security Act of 1951. This included the assignment of specialists in photogrammetry and topographic mapping to Burma and to the Hashemite Kingdom of Jordan, as well as the training of foreign technicians and the supervision, inspection, and testing of map compilation. In addition, the Division provided technical advice on mapping and photogrammetry to these agencies and to the United Nations.

Mapping Programs and Map Production

Mapping or map revision was carried on during the year in all the 48 States and in Alaska, Puerto Rico, and the Hawaiian Islands. Federal-State cooperative programs, whereby mapping costs are shared equally between a State, county, or municipality and the Federal Government, were conducted in the 29 States of Arkansas, California, Colorado, Connecticut, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Missouri, New York, Nevada, North Dakota, Ohio (Mahoning County), Oklahoma (Tulsa County), Pennsylvania, Tennessee, Texas (city of Austin), Utah, Vermont, Virginia, Washington, Wisconsin, and in Puerto Rico. Texas is a new cooperator in the list. The Survey also continued to cooperate with the Tennessee Valley Authority in completing the topographic mapping of the valley. This work has no relation to the Tennessee State cooperative program, which includes only those areas outside of the Tennessee River basin.

The high priority of the defense mapping program continued to restrict the beginning of mapping operations in areas outside the zones of military need. However, as the crest of this program passes, more Federal mapping can be started in areas of the greatest concentration of general mapping needs. The procedures established by the Bureau of the Budget for determining this concentration through requests submitted by the principal Federal map-using agencies were improved and used. These requests are weighed, along with State and individual requests, to determine areas of greatest need for maps, and the results are used in normal times to determine the Federal mapping program. The accuracy of the determination of priorities has been increased in several States by committees organized in these States to study and coordinate map needs. Through the efforts of such mapping advisory committees, coordinated expressions of map needs and priorities were received during the year from Florida, Minnesota, Nevada, Mississippi, and Washington. Several other States have organized committees which have not yet submitted statements of map needs.

As a part of the coordinated Missouri River basin development plan, topographic mapping operations were continued in the basin under a specific allotment of funds at approximately the same rate as in 1952.

In accordance with the policy of locating operational activities outside of the Washington area in order to conserve critical space needed for staff activities, the Special Map Projects Section was abolished. Its functions of preparing State base maps at a scale of 1:500,000 and other small-scale maps were transferred to the four regional offices.

Of the new series of State base maps that were in the course of preparation by this Section, those of Ohio, Illinois, and Oklahoma have been published; those of Missouri, New Mexico, and California are in the proof stage; and those of New York, Oregon, Pennsylvania, and Tennessee are being compiled.

Publication and distribution of a civil edition of the 1:250,000-scale maps of the United States were continued. These maps constitute a provisional series of 468 sheets being compiled by the Department of Defense (Army Map Service) for military purposes. Publication of the civil edition will provide reconnaissance topographic maps of many areas for which no topographic information of any kind has heretofore been available to the general public.

The Trimetrogon Section was designated the Special Maps Branch in order to conform more closely to standard departmental organization and to identify more clearly its present functions and responsibilities. Work was continued on the preparation of special maps and aeronautical charts for the United States Air Force Aeronautical Chart and Information Center. In general, this work consists of the compilation and revision of base charts, preparatory to photolithographic reproduction. These charts form an integral part of the overall program of the Air Force for the production and maintenance of adequate worldwide coverage of aeronautical charts. They are required for military use. About 281 charts were prepared, covering 121,000 square miles. These include 105,000 square miles of entirely new photocompilation and 16,000 square miles of revision and cartographic compilation. Various special projects covered areas in practically every part of the world. In addition, the Special Maps Branch completed 105 special maps, covering 12,000 square miles, for the Geologic Division, the Atomic Energy Commission, and other Federal agencies.

Mapping in the Territory of Hawaii was continued. Although no maps reached the publication stage, activity in ground control and compilation phases was conducted on 31 quadrangles covering a total area of 1,330 square miles. This work is to be published eventually at 1:24,000 scale. Operations during the year were conducted on the islands of Oahu, Molokai, and Maui. A priority military request was received which will extend the program to the island of Hawaii at an early date.

In Alaska, the accelerated mile-to-the-inch mapping program was continued, but the scale of operations was reduced somewhat. This accelerated program was started 2 years ago in accordance with military requirements. However, it also provides long-needed detailed terrain information for civil improvements, such as pulp and lumbering operations, transportation routes, power developments, and mineral investigations.

Mapping on this scale (1:63,360) was continued on 368 Alaskan quadrangles covering an area of about 75,000 square miles. Actual accomplishment, in terms of stereocompilation, was about 12,000 square miles, and 34 quadrangle maps were published.

A major achievement in Alaska was the completion of compilation work on the provisional issue of 1:250,000-scale topographic maps, thereby providing the first uniform series of maps for the entire Territory. During the year, 51 of these quadrangles were published, of which 30 are available also as shaded relief maps. The remaining eight quadrangles will soon be ready for distribution.

A mapping program has been started in the Virgin Islands in cooperation with the Office of Territories. Aerial photography, the first step in this program, has been contracted for delivery during the winter of 1953–54.

Accomplishments in the United States (excluding Alaska), in terms of square miles of new mapping and map revision, for each of the major phases of mapping activity, are as follows:

	New mapping	Map revision	Total
	Square miles	*Square miles*	*Square miles*
Photography	71,000	5,000	76,000
Horizontal control			68,300
Vertical control			60,600
Supplemental control			61,300
Stereocompilation (including 6,000 square miles by contract)			65,400
Field compilation	67,967	15,113	83,080
Drafting			87,300
Transmitted for reproduction	69,800	10,000	79,800

In addition, relief shading was completed on 23 quadrangles.

The horizontal control includes 34,000 square miles of triangulation and 6,700 linear miles of transit traverse. The vertical control represents 14,100 linear miles of leveling.

The total figure opposite each phase in the above tabulation represents approximately the annual accomplishments of the Division. Variations in these totals are due to changes in backlogs and to work done on projects in which only certain phases of activity were involved.

Topographic maps forwarded for reproduction total 1,324. Of these, 1,072 were 7½-minute quadrangles and 224 were of the 15-minute series. In addition, the Division prepared reprint editions of 150 quadrangle maps, 8 State base maps, and 56 State index maps. At the close of the fiscal year, 510 maps were in process of reproduction, including 15 reprints. During the year, 1,452 quadrangle maps were published, including 139 reprints. Of the 1,313 new and revised maps, 102 were compiled by Tennessee Valley Authority, United States Coast and Geodetic Survey, and Forest Service, and 176 were civil editions of Army maps previously compiled for military use. In keeping with policies, the topographic map material produced by these agencies is published and distributed to the general public by the Geological Survey.

A detailed summary of production, covering new mapping, remapping, and revision, is shown in the following table:

Areas (in square miles) mapped during fiscal year 1953 for publication on standard scales

[Contour intervals, 5 to 100 feet]

State	Area mapped, scale			New mapping	Revised mapping	Total
	1:24,000	1:31,680	1:62,500			
Alabama	578				578	578
Arizona			325	325		325
Arkansas						
California	7, 386		6, 907	9, 571	4, 722	14, 293
Colorado	2, 102			2, 102		2, 102
Connecticut		1, 236		341	895	1, 236
Delaware	86			55	31	86
District of Columbia						
Florida	5, 475			5, 475		5, 475
Georgia	61			61		61
Idaho	201		128	329		329
Illinois	670		835	988	517	1, 505
Indiana	1, 497			1, 395	102	1, 497
Iowa			347	347		347
Kansas	1, 265			1, 265		1, 265
Kentucky	10, 430			10, 430		10, 430
Louisiana	1, 569		508	2, 077		2, 077
Maine			1, 067	475	592	1, 067
Maryland	2, 152				2, 152	2, 152
Massachusetts		1, 155			1, 155	1, 155
Michigan	1, 716		693	896	1, 513	2, 409
Minnesota	752		986	1, 738		1, 738
Mississippi						
Missouri	2, 590			2, 590		2, 590
Montana	455			455		455
Nebraska	1, 451			1, 451		1, 451
Nevada	49		2, 028	[1] 2, 955		[1] 2, 955
New Hampshire			121	121		121
New Jersey	922			901	21	922
New Mexico	1, 864			1, 864		1, 864
New York	911		165	855	221	1, 076
North Carolina			192	192		192
North Dakota	1, 186			1, 186		1, 186
Ohio	663			610	53	663
Oklahoma						
Oregon	79		269	348		348
Pennsylvania	955		404	450	909	1, 359
Rhode Island		184			184	184
South Carolina						
South Dakota	2, 211			2, 211		2, 211
Tennessee	1, 319			1, 319		1, 319
Texas	2, 245			2, 245		2, 245
Utah	692		679	1, 371		1, 371
Vermont			547	30	517	547
Virginia	534		215	215	534	749
Washington	1, 233		1, 896	2, 876	253	3, 129
West Virginia	91				91	91
Wisconsin	514		1, 123	1, 564	73	1, 637
Wyoming	4, 288			4, 288		4, 288
Total	60, 192	2, 575	19, 435	[1] 67, 967	15, 113	[1] 83, 080
Alaska			[2] 12, 034	[3] 15, 534		[3] 15, 534
Puerto Rico		[4] 1, 509			1, 509	1, 509
Hawaii	200			200		200

[1] Includes 878 square miles mapped on a scale of 1:125,000.
[2] Mapped on a scale of 1:63,360.
[3] Includes 3,500 square miles mapped on a scale of 1:250,000.
[4] Mapped on a scale of 1:30,000.

Research and Development

Closely related to actual production are the activities in the field of research and development. Considerable progress was made in this field in efforts to speed up production and reduce costs.

One project, which is expected to lower appreciably the cost of drafting, concerned the introduction of the scribing method of preparing reproduction copy. In this process the map-compilation image is processed on a plastic or glass plate coated with a scribing emulsion. The plate is then placed on a light table where the operator scribes the image with specially designed tools. The process promises improved map quality and a considerable saving in both time and labor over the conventional smooth-line inking method. Considerable research and development work will be necessary to perfect the technique. Preliminary design was completed of a pantographic unit for the rapid scribing of contour numbers onto the contour sheets.

A pendulum-type optical-reading vertical-arc unit has been designed for converting standard alidades into optical-reading instruments, with an autoleveling pendulum replacing a manually adjusted level bubble. A working model has been constructed and preliminary tests have been satisfactory.

An important development project in the field of photogrammetry came to fruition with the completion of a prototype pair of ellipsoidal-reflector projectors. The use of such projectors is expected to result in substantial economies in the preparation of topographic maps from aerial photographs. First tests of this new photogrammetric instrument indicate that it will fulfill the high performance standards expected of it.

The twinplex plotter was redesigned and refitted to accommodate ellipsoidal-reflector projectors. This arrangement affords a highly efficient instrument for aerial triangulation and map compilation with twin low-oblique photography. Tests made gave excellent results, and contracts were awarded for delivery of a complete twinplex plotter and 10 pairs of ellipsoidal-reflector projectors to each regional office.

An important addition to the stereoplotting capacity of the Division was the delivery of four Wild A–8 plotters. These will be assigned to the four regional offices.

In an effort to increase the speed with which supplemental control can be obtained, and at the same time reduce its cost, an experiment was undertaken to obtain supplemental-control photography from a low-flying helicopter under constant ground observation by theodolite observers. This experiment was conducted with equipment provided by the Engineer Research and Development Laboratories during recent tests in Arizona. The technique is expected to reduce field operations considerably, although it will impose a new problem of office computing. The problem of handling the new computing load is expected to be solved by the Univac belonging to the Army Map Service. This instrument is a modern high-speed automatic digital computer.

An experiment using stereotemplets was made for the compilation of an area in Louisiana, and the results are being tested for accuracy. Stereotemplets are composite slotted templets designed to be adjustable in scale and representative of the horizontal plot of a stereoscopic model. An assembly of stereotemplets provides the means of obtaining an area scale solution mechanically and retains the geometric advantages of stereoplotting techniques.

A detailed study of appropriate contour intervals for use in planning future mapping was begun on a State-by-State basis. One plan has been completed and approved and eight others are currently in progress. These plans are a joint responsibility of the regional office concerned and the Division office.

Moderate progress has been maintained in preparation of the Topographic Manual. Eleven more chapters were published, bringing the total to 30. Forty-five other chapters are in various stages of preparation. It is estimated that the task is about 35 percent completed.

The training film Supplemental Control for Topographic Mapping was completed during the year, and considerable progress was made on the film Triangulation for the Control of Topographic Mapping.

Map Information Office

In addition to the various services provided by the Map Information Office to map users, facilities were established for over-the-counter sales of maps in the General Services Administration Building. This was necessitated by the removal of distribution facilities to Silver Spring, Md.

The volume of requests for survey and map data continued to increase, and the office serviced more than 53,000 requests of this kind during the year—an increase of 18,000 over the previous year.

The demand for control data was also much larger than last year. In terms of 15-minute quadrangle units, about 16,000 copies of horizontal and vertical control data were supplied.

An accelerated demand for aerial photography was also reflected by an increase in the number of reproductions supplied during the year, the total being about 94,000 prints. In connection with this service, the office issued the sixth edition of the status map Aerial Photography of the United States.

The Map Information Office, in cooperation with the four regional offices, supplies preliminary map material in advance of final publication. During the year these offices filled 65,000 requests for such material—an increase of more than 25,000 over the previous year.

During the year, some 15,000 persons used the service facilities of the office to obtain data on surveys and maps, ranging from information on early maps and field notes to the most recent survey data. By the end of the year, about 20,000 maps had been sold over the counter.

WATER RESOURCES DIVISION

For more than 60 years the Water Resources Division has applied the scientific and technical skills of its personnel to the determination of basic facts about one of our most essential natural resources—water. During fiscal year 1953 this program was carried out vigorously in financial cooperation with more than 250 Federal, State, and municipal agencies.

Except in some areas, like the Southwest, ours is a water-rich land; yet today water supply has become a major problem in the United States. Our water needs are increasing so rapidly that there are water shortages in many places. Texas is an outstanding example of this tremendous expansion in the use of water. In the 50 years from 1890 to 1940 the population of Texas increased less than 3 times, while municipal and industrial use of water increased almost 30 times. The national per capita use of water quadrupled from 1900 to 1950, and the President's Materials Policy Commission estimates that demands for water will nearly double again between 1950 and 1975. This increased use of water is basically caused by the multiplying effects of our population growth and our rising standard of living. As our national economy develops and becomes more mature, it becomes increasingly evident that our water resources are the keystone in our long-range security program and must be better utilized and conserved.

Fundamental to the management of water resources is the availability, in usable form, of basic information about the occurrence, availability, and quality of our water.

The Water Resources Division is responsible for the collection, compilation, and interpretation of this basic information relating to surface and subsurface waters. This program is carried on by the 120 principal field offices of the Surface Water, Ground Water, and Quality of Water Branches.

In fiscal year 1953, approximately one-quarter of the funds available for water-resources investigations was transferred from 15 Federal agencies for specific work performed for them, approximately one-quarter was provided by States and municipalities for cooperative investigations, and nearly one-half was directly appropriated. The total funds available for the 1953 program were about 10 percent greater than those available for 1952.

Funds made available by States and municipalities to the Division for cooperative studies were:

	Obligations
Alabama	$86, 678
Arizona	105, 454
Arkansas	50, 742
California	267, 850
Colorado	54, 300
Connecticut	18, 800
Delaware	13, 395
Florida	129, 043
Georgia	48, 900
Idaho	57, 166
Illinois	61, 337
Indiana	90, 354
Iowa	79, 874
Kansas	53, 425
Kentucky	152, 602
Louisiana	95, 000
Maine	10, 500
Maryland	77, 467
Massachusetts	37, 130
Michigan	65, 915
Minnesota	46, 618
Mississippi	25, 803
Missouri	35, 124
Montana	30, 052
Nebraska	61, 456
Nevada	25, 664
New Hampshire	$11, 912
New Jersey	62, 936
New Mexico	113, 302
New York	209, 041
North Carolina	71, 596
North Dakota	32, 579
Ohio	130, 620
Oklahoma	74, 070
Oregon	61, 948
Pennsylvania	133, 776
Rhode Island	14, 850
South Carolina	26, 598
South Dakota	8, 500
Tennessee	62, 653
Texas	331, 632
Utah	98, 996
Vermont	7, 760
Virginia	75, 774
Washington	124, 477
West Virginia	18, 653
Wisconsin	32, 639
Wyoming	38, 451
Hawaii	80, 193
Total	3, 603, 705

Water-resources information is disseminated principally through publications designed to make this vital information available to all at the lowest possible cost commensurate with good operations. The Division also answered several thousand requests for specific data during 1953. These requests come from State and Federal agencies, commercial firms, and individuals.

Public Water Supply

In fiscal year 1953 the Division published a series of nine preliminary reports containing data pertaining to public water supplies of more than 1,200 larger cities of the United States. These reports fill an important need in the field of water-supply engineering by bringing up to date the information contained in Water-Supply Paper 658: The Industrial Utility of Public Water Supplies in the United States, 1932.

The Division also cooperated with other defense agencies in 1953 in developing security principles for the water works industry.

Industrial Water Supply

Present-day industrial plants require immense amounts of water of suitable quality for both current operation and possible future expansion. Studies of the quantitative and qualitative water requirements of industry that were carried on in 1952 were continued in 1953. Field investigations of the water requirements of the rayon, acetate, and nylon fiber, and the aluminum industries were completed. A report on the requirements of the pulp and paper industry for the use of defense agencies was completed and work was begun on a similar report for public release. These reports will be of great value in overall industrial planning and will help in bringing about understanding and cooperation among industries that must share a common water supply.

Increasing emphasis was given to the collection of data on water temperatures of streams throughout the Nation. The demand for these data has grown tremendously because of the use of streams for cooling and other industrial purposes. Regular temperature readings were taken at more than 300 sites, and in addition more than 50 self-recording water-temperature stations were operated throughout the country.

Public water supplies are utilized extensively for many industrial plants and the nine reports on public water supply mentioned above proved to be extremely valuable in the design and operation of these plants.

As an outgrowth of the successful mine-drainage studies in northern Michigan and in east Tennessee, more extensive studies of mining hydrology were begun in Alabama, Arkansas, and Wisconsin, where ground water is hindering mining operations.

Flood-Control, Hydroelectric-Power Dams, Flood Forecasting, Navigation, Interstate and International Allocations of Water

Records of stream discharge were collected at about 6,400 gaging tations in the 48 States and in Alaska and Hawaii. The stations were operated through 44 district offices, in cooperation with 170 gencies of State and political subdivisions and with 15 Federal gencies. These records are published in the annual series of water-upply papers entitled "Surface Water Supply of the United States." These records are an absolute prerequisite to engineering studies for he location, design, and operation of hydroelectric-power and flood-ontrol dams, levees, bridges, and many other hydraulic structures. Sedimentation records, collected and interpreted by the Division, also provide data essential to the design of dams and reservoirs. Dams built without consideration of the sediment factor may be rendered ineffective in a short period of time by the accumulation of sediment.

Records of streamflow are used in the forecasting of floodcrests in all parts of the Nation. In addition to the uses governmental and private hydrologists make of published information, the Division receives many specific requests for information concerning floods.

Six flood reports and three areal flood-frequency studies were published during the year. These studies furnish data indispensable to the most effective design and location of bridges, highways, dams, and other structures.

Four reports, published as Geological Survey circulars, evaluate streamflow records in four river basins in the Pacific Northwest. They show the influence of the various factors resulting from man-made structures on the discharge records in the basins.

Streamflow data are generally required as the bases for the apportionment and division of interstate waters. Eleven interstate compacts, providing for such apportionment, are now in effect and three are under negotiation. These compacts include provisions for the establishment and operation of streamflow measurement stations, usually by the Geological Survey.

The Geological Survey, using funds transferred by the Department of State, made water-resources investigations along the Canadian boundary that are required by the Boundary Waters Treaty of January 11, 1909, between the United States and Canada, or by orders issued by the International Joint Commission.

The Federal Power Commission requires licensees operating major hydroelectric-power-generating systems to measure the flow of streams used in producing power. The Geological Survey supervised stream gaging on nearly 200 licensed projects during 1953 at the request of the Commission.

Irrigation

The Nation's greatest use of fresh water, about 80 percent of the total consumption, is for irrigation. The Division assisted in the development of irrigated agricultural areas through its network of stream-gaging stations and several special investigations. Among these was a ground-water investigation in the Oahe irrigation unit in the James River drainage basin in South Dakota, where the studies delineated an aquifer capable of yielding sufficient water for irrigation. The boundaries of the area were outlined from the study of logs of test holes drilled by the Bureau of Reclamation, and from geologic and hydrologic studies made by the Geological Survey.

During the year, 114 sediment stations were operated on streams in the western United States. From these stations data are obtained on the quantity and characteristics of sediment transported. These data are required in the efficient planning and operation of storage reservoirs, diversion structures, and canal distribution systems. History gives many examples of irrigation structures which failed because the builders did not understand and resolve the problems introduced by sediment in the streams.

Pollution

Increasing recognition is being given by State, Federal, and private agencies to the impairment of the quality of natural waters by industrial wastes, mine drainage, irrigation-return flows, and other sources of pollution. In 1953 the Division broadened the scope of its studies of chemical quality so that mineral pollutants occurring in natural waters can be properly evaluated. In many parts of the country it has been found highly essential to include analyses for trace metals and other minor constituents in solution. These are often present as a result of pollution; and, although occurring in very minute quantities, they have a distinct bearing upon the utilization of the particular supply for certain purposes.

The Division is also giving increasing attention to the duration and frequency of periods of low flow in streams because the release of waste is often dependent upon the volume of water available for dilution. Adequate control of pollution in many streams requires a high degree of treatment or temporary storage of wastes during low-flow periods. The duration and frequency of these low-flow periods, therefore, directly affect the design and cost of waste-collection and waste-treatment systems.

Salt-Water Encroachment

In 1953 the Division continued its studies of salt-water encroachment in tidal streams and in fresh-water underground sources. A report was released in 1953 dealing with conditions in southwest Louisiana where the movement of salt water from the Gulf of Mexico and tidal streams into the fresh-water aquifers is creating serious problems. Studies in tidal streams were continued in the Trinity River in Texas, the Combahee River in South Carolina, and in the lower Delaware River. The possible utility of a fresh-water barrier to prevent salt-water encroachment in the Manhattan Beach, Calif., area was given further study. Wells for injecting water into the aquifer to form the fresh-water barrier are being used with notable success.

Salt-water encroachment problems in Florida have led to additional studies to determine the origin and extent of salt-water migration into fresh-water aquifers. Investigations were undertaken in Manatee and Seminole Counties, Fla., to study the effects of reducing the migration of saline water into aquifers by recharging these aquifers with fresh water. Such investigations will furnish extremely important information for many Coastal Plain areas where fresh water floats on or is adjacent to denser saline waters that are the remnant of the ancient seas that once flooded the region.

Radioactivity

A program to determine and interpret the radioactivity of natural waters was begun. When background radioactivity values for natural waters and rock formations are determined, changes that might occur through contamination by fissionable material can be observed. Such studies may also lead to the discovery of sources of fissionable material. Laboratory facilities at Denver, Colo., for determining radioactive substances and trace elements in water samples were nearly completed during the year.

Preliminary work in determining background radioactivity revealed the need to facilitate collection of data in the field by developing techniques of analysis and by using measuring equipment. Some study was made of procedures for the collection and preservation of samples containing minute traces of radioactive substances.

Assistance to the Atomic Energy Commission on problems of water supply and waste disposal at established sites, and in the selection of new sites for installations, was continued. The selection of sites is influenced by the availability of supplies of surface water, ground water, and possible pollution from disposal of radioactive wastes.

Soil and Moisture Conservation

The soil- and moisture-conservation program of the Division provides the facts needed to protect water supplies on Federal lands of the West under the custody of the Department of the Interior and to maintain these Federal lands at high productivity. During 1953 the Survey's program included prospecting for and discovery of new sources of range-water supplies on public lands in the arid and semiarid areas, thus permitting better utilization of these lands. Investigations that were begun in 1952 to determine the rate at which reservoirs were being filled with sediment, as a measure of the erosion taking place upstream, were continued in 1953. These surveys also showed the extent to which water was wasted by evaporation. Results of the Lake Hefner, Okla., investigation to develop basic methods for measurement of evaporation from reservoirs were published in 1953. This successful research is now in the application stage, and the procedures are being applied at Lake Mead, the key reservoir in the management of the lower Colorado River. Studies are under way near Fairbury, Nebr., to determine whether similar principles can be applied to the measurement of water lost by vegetation through evaporation and transpiration.

Missouri River Basin

Investigation of the water resources of the Missouri River basin for the Bureau of Reclamation and the Corps of Engineers was carried on during the year. This work included stream measurements at nearly 300 stream-gaging stations, 53 projects relating to ground-water supplies or to changes in ground-water conditions that may result from reservoir construction or irrigation in the vicinity of reclamation units, more than 60,000 measurements of the sediment content of surface water at 89 stations, and more than 10,000 analyses of chemical quality of stream water at 28 stations.

A comprehensive report on problems of sedimentation and chemical quality of surface water was completed for the Powder River basin in Colorado and Montana, and released as Circular 170.

Water-Resources Evaluation

The Division is engaged in preparing integrated reports summarizing and evaluating water-resources information for specific areas. These reports were initiated at the request of the National Security Resources Board in order that adequate appraisal of the water resources of specific areas would be available for defense agencies. In 1953, reports were published on 5 large industrial centers, and reports on 8 additional centers were in progress. The reports are designed to supply answers to questions on industrial, municipal, and rural water supply, flood protection, and pollution control. All available water-resources data are summarized, interpreted, and evaluated for the areas, including location, quantity, quality, temperature, and utiliza-ion of both ground-water and surface-water supplies, flood and low-low frequencies, flood profiles, and effects of existing and proposed reservoirs.

Progress was made on the compilation and condensation into one volume of all streamflow records prior to 1950 for each area covered by an annual report on surface-water supply. At present a single nquiry for information may require research into as many as 50 separate volumes. At the end of the fiscal year the project was about 25 percent complete.

Technical-Assistance Program

Water-resources investigations under terms of the Mutual Securit Act were continued in Saudi Arabia, India, Iran, Libya, and Afghanistan. Additional personnel were assigned to work with the Geological Survey of India in ground-water development projects, and a surface-water engineer was assigned to Saudi Arabia. A specia ground-water investigation was made in Brazil for a proposed phosphate-mining development.

Personnel of Thailand, Turkey, India, Pakistan, Israel, and the Philippines received training in field offices of the Division.

Other Work

The Division was called upon to assist in the preparation of a series of documents entitled "The Physical and Economic Foundation of Natural Resources." Their preparation was requested by the Committee on Interior and Insular Affairs of the House of Representatives to provide facts to serve as an adequate guide for achieving a sound natural-resources policy for our Nation's economy.

The Division undertook a program of coordinating drainage-area data with other Federal agencies and States, and of disseminating these data. The purpose of this program is to achieve consistency in the use of drainage area data by various agencies.

The Division continued to participate in the Department's saline-water program through the Advisory Committee on Saline-Water Conservation. Technical assistance and advice were given on problems within the Division's special fields of activity, particularly on the occurrence and chemical quality of saline waters in the United States. In the past, efforts have been devoted almost entirely to evaluation of fresh-water resources because saline waters have thus far not been considered a usable resource. However, random information on water of a saline character exists in the many resource publications of the Survey. Plans are being made for assembling such information in more usable form as a secondary step.

Studies of the potability of water at continental and offshore installations of the Department of the Army and Department of the Air Force were continued during 1953. More than 1,300 analyses were made to determine alterations in the chemical quality of this supply.

Research

A research program was completed on the flow of water through single contracted openings. The results will be useful in bridge design and in computing by indirect method the flow through bridge openings.

A tentative design was completed, and invitations for contract issued for the construction of a development model of an electronic computer to perform much of the laborious, routine work in computing streamflow records.

Studies of the way in which sediment originates, enters the stream channel, is transported, and is finally deposited, were continued. The study of the amount of sediment transported as bedload was continued at six locations in the Missouri River basin and in the Rio Grande basin.

Research directed toward the development of improved sediment samplers was continued during the year in collaboration with other Federal agencies. These joint research efforts resulted in the perfection of a visual accumulation tube for rapid and accurate determination of the distribution of particle size of sands.

Research on ground water in Arctic regions was continued, through cooperative studies with the Corps of Engineers. A report entitled "Ground-Water Development in the Arctic," in three parts, covering geological, geophysical, and airphoto interpretation of permafrost terrain, was submitted to the Corps of Engineers.

A study of the effect of ground-water movement on the accumulation of oil and gas was begun by the Ground Water Branch in the Bighorn Basin, Wyo. Research in oilfields shows that the occurrence and movement of ground water in oil-bearing formations is a controlling factor in the accumulation of oil and gas in some regions. In these regions such studies may indicate where commercial quantities of oil and gas are present.

CONSERVATION DIVISION

The Conservation Division classifies Federal lands as to mineral and water resources and supervises mineral-recovery operations under eases, permits, and licenses on Federal, Indian, and naval petroleum-reserve lands. A small headquarters staff and a field staff of compeent geologists and engineers are maintained. This force makes field surveys, prepares maps and reports dealing with waterpower, fuels, minerals, and chemicals essential to the mineral-resource economy of he United States, and conducts on-site supervision of mining and drilling operations necessary to assure the safe and economical production by private enterprise of coal, oil, gas, and other minerals.

Mineral Classification

All services rendered by the Mineral Classification Branch were maintained at a continued rapid pace in fiscal year 1953. In all, 19,259 cases were acted upon. They involved the outright disposal of Federal lands with no reservation of any mineral, the disposal of such lands with the reservation of one or more specified minerals, or the exercise under the Federal leasing laws of the Government's right to lease for exploration and production, by private enterprise, one or another mineral substance from lands under its jurisdiction. In addition, the Branch prepared and promulgated initial or revised definitions of the known geologic structure of 94 producing oil and gas fields containing Federal lands; appraised geologically 204 unit-plan and participating-area proposals; drafted 30 determinations of leasehold relations to the productive limits of producing oil and gas deposits as found to exist on August 8, 1946; reported for appropriate administrative action the fact and geologic significance of 58 new discoveries of oil or gas made on or affecting Federal-land leaseholds; recommended the competitive sale of oil and gas leases on 32 parcels of public land; reviewed and reported upon 76 appeals from decisions of the Bureau of Land Management affecting the disposal of Federal lands; and prepared 65 miscellaneous reports on the mineral potentialities of specific lands for various agencies of the Federal Government and inquiring individuals.

From field offices in Colorado, Wyoming, Utah, Montana, California, New Mexico, and Oklahoma, geologists made "demand" or specific investigations which resulted in geologic reports and maps for official use by the Washington staff, by other branches of the Conservation Division, and by other Bureaus of the Department concerned with mineral and water-power conservation and administration. The Branch completed reports on the coal resources of the Palisade district, Mesa County; the Ohio Creek district, Gunnison County; the Curtis Creek district, and Streeter mine, Axial district, Rio Blanco County; and the Yampa field, Routt County—all in Colorado; the Drummond field, Granite County, Mont.; and of a part of Iron County, Utah; on the oil and gas resources of the Newcastle field, Cleveland and McClain Counties, Okla.; the Sage Creek field; Natrona and Converse Counties, Wyo.; the Elk Basin field, Park County, Wyo., and Carbon County, Mont.; and of the Kettleman Hills, Lost Hills, and Buena Vista fields, Calif.; on the thickness of post-oil-shale sediments, Uintah County, Utah; on the geologic structure of the Homochitto National Forest, Miss.; on the Cretaceous-Tertiary boundary in a well in Moffatt County, Colo.; and on fluorspar occurrence in Hardin County, Ill.

Water and Power Classification

The field work of the Water and Power Branch during 1953 was directed mainly toward obtaining basic information on the waterpower resources and storage possibilities of Federal lands on which projects were proposed for early development. Work was done in Alaska, California, Montana, Nevada, New Mexico, Oregon, and in the Colorado and Columbia River basins. Surveys and maps were made of 5 reservoir sites, 4 dam sites, and 199 miles of river channel, and geologic investigations of 12 dam sites and 4 reservoir sites. Supervision of construction and operation was given to 134 power projects under license from the Federal Power Commission, to 671 such projects under permit or grant from the Department of the Interior, and to 200 in cooperation with the Bureau of Indian Affairs.

Classification activities resulted in the addition of 18,926 acres to power-site reserves and the elimination of 2,244, increasing the outstanding reserves in 23 States and Alaska to a net total of 6,942,452 acres. Ten maps were published covering 255 miles of stream channel of 8 rivers, 20 dam sites, 8 reservoir sites, and 2 glaciers. Final action involving hydraulic determination was taken on 1,259 cases received from departmental sources and the Federal Power Commission, and on 5,334 cases that also concerned mineral classification.

Investigations were in progress on the power and water-storage possibilities of 60 rivers. Two reports on power possibilities of certain streams and three geological reports on dam sites were made available for public inspection.

Mining Branch

The Mining Branch supervises operations for the discovery, development, and production of coal, potassium, sodium, sulfur, phosphate, and oil shale from public-domain lands; of silica sand on lands in Nevada subject to Executive Order No. 5105; of gold, silver, and mercury on certain Spanish land grants; of all minerals except oil and gas on restricted allotted and tribal Indian lands, and on acquired lands under the act of August 7, 1947, and provisions of section 402 of the Reorganization Plan No. III of 1946; and on public land in the Superior National Forest, Minn. Outstanding mineral leases and permits involve exploration for and production of copper, nickel, gold, silver, manganese, uranium, asbestos, limestone, gravel, coal, potassium, sodium, phosphate, sand, marble, silica rock, iron, gypsum, pumice, clay, bentonite, fluorspar, feldspar, lead, zinc, barite, mica, tungsten, and garnet.

The Branch is responsible for investigating and reporting on applications for leases and prospecting permits; recommending lease terms; enforcing regulations and lease terms governing the conduct of prospecting, mining, and refining, and the safety and welfare of employees; protecting natural resources and preventing waste; determining royalty liability of lessees and permittees; preparing statements of accounts; and receiving payment of royalties and rentals. The Branch acts in an advisory capacity to the Office of the Secretary and to other units of the Department and other Government agencies in the administration of leases, permits, and licenses.

As of June 30, 1953, the Branch was supervising 1,261 properties under leases, permits, and licenses in 27 States and Alaska, of which 805 were on public domain, 145 on acquired lands, and 311 on Indian lands. Production from such lands under supervision during the year is estimated at 18,874,000 tons, valued at $120,649,000, with accrued royalty amounting to $4,455,300. This compares with a production of 15,707,399 tons valued at $110,030,000 and a royalty of $3,900,209 during the previous fiscal year.

The production of coal from public land in the United States and Alaska, including the former Choctaw-Chickasaw Indian coal land in Oklahoma, aggregated 7,016,600 tons, a decrease from the previous year's production, which was 7,883,624 tons. Production of coal in Alaska, however, increased from 538,961 tons in 1952 to 805,258 tons in 1953.

The five operating mines on public lands in the New Mexico potash field produced a total of 7,602,847 tons of crude potassium salts valued at $48,252,659 in the fiscal year. Royalty returns to the United States on this production were $1,561,469. New mines are expected to be opened to develop reserves disclosed by core drilling. One refinery has constructed facilities to produce magnesium oxide and hydrochloric acid from refinery waste. Production from the Searles Lake brines at Trona, Calif., was 254,459 tons of potassium salts valued at $5,531,700, and royalty returns to the United States were $165,953. Mines and refineries in New Mexico and California now have a capacity in excess of 1.8 million tons of K_2O equivalent a year. A new electromagnetic process for the beneficiation of chloride salts, known as the LeBaron-Lawver process, was announced during the year. The process is reported to be more economical and efficient than the flotation and solution processes now in use. It is expected that a pilot plant to test the new process will be constructed before long.

Besides the foregoing production of potassium, the Searles Lake deposits accounted for 576,218 tons of the total 613,328 tons of sodium compounds produced from lands under supervision. These sodium compounds yield borax, soda ash, salt cake, bromine, burkeite, and lithium. Although only 13,588 tons of soda ash were produced from Government land at Westvaco, Wyo., further refining facilities with an annual capacity of 300,000 tons of soda ash, costing in excess of $15,000,000, were completed during the year. Salt from the New Mexico potash mines accounts for the remainder of the sodium production.

Phosphate rock and shale production during 1953 was 1,237,173 tons, as compared to 737,233 tons during the previous year. Of the total output, 508,650 tons were from public domain, 3,136 were from acquired lands, and 725,387 tons from Indian lands. Production of elemental phosphorus from an electric furnace at Soda Springs, Idaho, began in February 1953. There are 5 electric furnaces now operating, and 2 additional furnaces are under construction, all located in Idaho and Montana, with a total capacity of 90,000 tons of elemental phosphorus a year. This represents 31 percent of the total national capacity of phosphorus. The total annual capacity for the production of elemental phosphorus in the United States in 1940 was 0,000 tons.

Production of lead and zinc concentrates from Quapaw Indian lands n Oklahoma was 47,800 tons, valued at $5,205,000, and having a royalty value of $428,300.

Coal, fluorspar, zinc, asbestos, bentonite, manganese, mica, phosphate, quartzite rock, stone, sand, and gravel were produced from acquired lands in 9 States to an aggregate of 146,382 tons valued at $1,076,381, with a royalty value of $33,915. There is wide interest in the development of manganese in Virginia and Tennessee. Many of these properties on national-forest lands have been idle since the turn of the century. Mica development in North Carolina and Georgia, and manganese development in Virginia and Tennessee, have been encouraged by the Government's purchase program. Consideration is presently being given to the development of tungsten in Virginia and North Carolina on Department of the Army lands. A total of 27 nickel-cobalt-copper prospecting permits have been issued for lands in the Lake Superior National Forest, Minn.

In recognition of outstanding safety achievements, 3 coal lessees and 2 potash lessees received awards from the Joseph A. Holmes Safety Association. The Reliance No. 7 Mine of the Union Pacific Coal Co., on August 26, 1952, received the Sentinels of Safety trophy for the best safety record in bituminous mines in the United States during 1951. These awards attest to the safety achievement and cooperation of employees and industry in the conduct of mine operations.

Oil and Gas Leasing Branch

The Oil and Gas Leasing Branch supervises operations for the discovery, development, and production of crude oil, natural gas, and products extracted from natural gas on Federal and Indian lands. These duties were carried out during the year by means of 5 regional offices and 20 district offices at 19 separate locations in California, Colorado, Louisiana, Montana, New Mexico, Oklahoma, Utah, Wyoming, and Washington, D. C.

On the public lands, 78,785 oil and gas properties were under supervision at the end of the fiscal year, aggregating 49,912,918 acres in 23 States and Alaska, an increase of 24.73 percent in the number of properties and 2.77 percent in the acreage under supervision at the close of the previous fiscal year.

Drilling on public lands during the year included the spudding of 1,213 wells and the completion of 1,109 wells, of which 696 were productive of oil and gas and 413 were barren. In all, 18,840 wells, including 10,154 capable of oil and gas production, were under supervision on June 30, 1953. The production from petroleum deposits on the public lands in 1953 was appreciably greater than in 1952. Production from the public lands in fiscal year 1953 was about 97,233,100 barrels of petroleum, 195,656,781,000 cubic feet of natural gas, and 191,579,853 gallons of gasoline and butane, with royalty returns to the Government of $30,529,700.

There were 2,012 acquired-land leases, embracing 1,881,041 acres in 26 States, under supervision at the close of the fiscal year. Drilling on acquired lands during the year included the spudding of 60 wells and the completion of 56 wells, 28 of which were productive of oil or gas and 28 of which were barren. In all, 396 acquired-land wells, including 230 capable of oil or gas production, were under supervision on June 30, 1953. The production from acquired lands in fiscal year 1953 was about 4,461,547 barrels of petroleum, 521,002,000 cubic feet of natural gas, and 55,403 gallons of gasoline and butane, with royalty returns of $1,415,000.

The Branch supervised operations on 8,271 leaseholds, embracing 1,762,372 acres on Indian lands in 17 States, which contained at the end of the year a total of 8,334 wells, 4,250 of which were productive of oil or gas and 343 of which had been completed in the year. The total revenue from royalties, rentals, and bonuses amounted to $16,475,260.

There were 11 protective leases outstanding on June 30. These leases were issued to protect from drainage Federal lands not subject to the Mineral Leasing Acts, and consist of a national monument and parts of military reservations such as airfields and ordnance plants. A total of 37 productive wells have been drilled on these leases, and royalty returns for the year were in excess of $555,000.

On behalf of the Department of the Navy, supervision was continued over the production of oil, gas, gasoline, and butane from 17 properties under lease in Naval Petroleum Reserve No. 2 in California. Production from 274 active wells in this reserve totaled 2,340,000 barrels of petroleum, 1,449,000,000 cubic feet of natural gas, and 9,250,000 gallons of natural gasoline and butane, with an aggregate royalty value of $905,000.

On Department of the Army lands in the Rio Vista, Calif., gas field, the work of the Branch included the consideration of revisions to the compensatory royalty agreements, approval of a number of revisions in participating percentages for these lands, and the computation of royalties due the United States. The gas production allocated to the lands was 3,387,000,000 cubic feet, the condensate production allocated was 1,050,000 gallons, and the aggregate royalty value was $409,600.

Activities toward unitization of oil and gas operations involving Federal land were reflected in the approval of 74 new unit plans during the year and the termination of 34 previously approved unit plans, leaving 267 approved plans, covering 4,501,838 acres, outstanding on June 30, 1953. About 46.84 percent of the petroleum obtained from public lands during the year was produced under approved unit agreements, as was 28.28 percent of the natural gas and 61.32 percent of the gasoline and butane. No Indian-land unit agreements were approved in the year, but a total of 11 such approved plans covering 87,320 acres was outstanding on June 30, 1953. Also, 70 drilling-unit agreements were approved during the year, making a total of 246 approved as of June 30, 1953; these agreements include tracts which are consolidated to form a logical drilling unit for each well in accordance with the well-spacing program for the field and, in effect, constitute an agreement similar to a unit agreement.

A development contract, providing for the exploration and development of nearly 1,000,000 acres of land in the Katalla-Yakataga area of Alaska, was approved.

WORK ON PUBLICATIONS

Texts

During the year, 216 new manuscripts were received by the Section of Texts, 207 manuscripts were sent to the printer, and 184 publications were delivered by the printer. Work on these included 19,625 pages of manuscript edited and prepared for printing; 3,770 galleys of proof and 7,969 pages of proof revised and returned; indexes prepared for 64 publications, covering 527 pages and consisting of 15,990 entries. Copy edited in preparation for duplicating included 112 pages of miscellaneous material.

Reports delivered are as follows: Professional Papers 218, 233–E, 234–A, 238, 243–A, 243–B, 243–C, 243–E, 243–G, 244, 248–A, 248–B, 248–C, 248–D, 248–E, 248–F, 248–G, 249–A, 251, and 252; Bulletins 966, 972, 976, 982–A, 982–B, 982–C, 982–D, 982–E, 983, 985, 988–A, 988–B, 988–C, 988–D, 988–E, 988–F, 989–A, 991–B, 991–C, 991–D, 993, and 1002–A; Water-Supply Papers 1110–D, 1110–E, 1132, 1133, 1134–B, 1135, 1137–B, 1137–C, 1137–E, 1138, 1139, 1141, 1152, 1153, 1155, 1156, 1165, 1166, 1167, 1168, 1169, 1170, 1172, 1173, 1174, 1175, 1177, 1178, 1179, 1180, 1181, 1182, 1184, and 1227–A; Circulars 92, 156, 157, 158, 161, 162, 167, 168, 169, 171, 173, 174, 178, 179, 180, 181, 182, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 195, 197, 199, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 231, 232, 233, 234, 236, 237, 239, 240, 241, 242, 244, 245, 246, 248, 250, 251, 252, 253, 254, 257, 258, 264, 265, 267, 269, and 272; Topographic Instructions 1B2, 1B4, 2D3, 2D4, 2E1, 3A9, 3A10, 3C6, 3C19, 3E2, and 6B1; and miscellaneous reports.

These reports cover a wide range of subject matter: General geology of particular areas; mining districts, and local mineral deposits in the United States, Alaska, and Hawaii; studies of fossils and the rocks in which they are found; a collection of papers on geochemical research; geophysical abstracts, a quarterly serial; measurements of streamflow and of water levels and artesian pressure in wells; general studies of underground water and of the occurrence of floods, with consideration of the influence of geology and physiography.

In order to keep the public informed, 12 lists of new publications were issued. Also printed during the year was the Fourth Supplement to Publications of the Geological Survey, 1948. Copy for Publications of the Geological Survey, 1953, was prepared.

Illustrations

Of a total of 52 reports on hand at the beginning of the fiscal year, illustrations for 36 were in various stages of completion. Eighty-six new reports were received, making a total of 138. The illustrations for 74 of these reports were completed and transmitted for publication, as compared to 31 last year. This leaves 64 reports on hand, 44 of which are in various stages of completion.

Illustrations transmitted include those for 24 professional papers, 37 bulletins, and 13 water-supply papers, which contained 2,574 completed drawings and photographs. Illustrations were prepared for 61 circulars, for which 573 drawings and photographs were completed; and 180 drawings and photographs were prepared for a special congressional report made by the Water Resources Division. This gives a total of 3,327 illustrations prepared by the Section of Illustrations.

Map Reproduction

In the fiscal year, 3 copper-engraved and 1,301 photolithographed topographic quadrangle maps, 15 river survey maps, 2 planimetric maps, 10 geologic index maps, 62 topographic index maps, 33 geologic maps, and 26 special maps were printed, making a total of 1,452 new maps printed and delivered. Reprint editions of 97 engraved topographic maps, 31 photolithographed topographic maps, and 27 photolithographed State, geologic, planimetric, preliminary, and other maps were printed and delivered. Of new and reprinted Geological Survey maps, 1,607 different editions, amounting to 3,842,244 copies, were delivered.

Work was done for 31 units of the Government, including branches of the Geological Survey and various States. Charges for this work amounted to $1,000,531.86.

Transfer impressions and velox impressions numbering 492 were made during the year.

Including materials printed for the Geological Survey and other State and Federal agencies, 4,065,517 copies were printed and delivered.

The photographic laboratory made 9,221 photolithographic negatives, 2,250 photographic negatives, 14,128 prints, and 903 lantern slides; developed 70 film packs and 78 rolls of film; and developed and printed 37,324 feet of aerial film. The Photo-Process Section made 8,161 photolith press plates. The Hand Transfer Section made 721 printing plates.

Distribution

In the fiscal year, 1,900 publications were received. These comprise 198 new reports of book and pamphlet form and 61 reprints, 18 oil and gas investigation maps and charts and coal investigation maps, mineral investigation maps and 22 other geologic maps and indexes, 15 river surveys, 1,391 new topographic and other maps and indexes, and 155 reprinted maps.

The total units received numbered 410,250 books and pamphlets, 186,040 copies of revised index maps, and 3,745,774 topographic and other maps, making a grand total of 4,342,064.

Units distributed include 228,372 books and pamphlets, 443 geologic folios, 2,238,847 maps, and 186,040 topographic indexes—a grand total of 2,653,702, of which 433 folios and 1,382,680 maps were sold. Distribution of maps and folios was divided among Geological Survey offices as follows:

Washington	1,377,804
Denver	832,714
Alaska	13,261
Other field offices	15,511
Total	2,239,290

The total receipts from sales of maps and folios amounted to $313,168.84. Distribution of these receipts is as follows:

Washington	$226, 952. 83
Denver	77, 792. 52
Alaska	1, 575. 52
Other field offices	6, 847. 97
Total	313, 168. 84

Included in the total above is $39,384.49 paid by other Government agencies for maps and folios furnished. The total receipts for maps and folios represent an increase of $42,699.53 over the previous year.

The maps distributed were supplied in response to 148,521 requests. A total of 19,374 letters of a nonroutine nature were prepared in reply to orders received.

The following table shows the publications on hand July 1, 1952, those received and distributed during the year, and the total on hand June 30, 1953:

	On hand July 1, 1952	Received	Distributed	On hand June 30, 1953
Geologic folios	11, 448		443	11, 005
Maps and indexes	22, 667, 998	3, 931, 814	2, 424, 887	24, 174, 925
Books and pamphlets	546, 762	410, 250	228, 372	728, 640
Total	23, 226, 208	4, 333, 375	2, 653, 702	24, 914, 570

FUNDS

During the fiscal year 1953 obligations were incurred under the direction of the Geological Survey totaling $48,055,775. Of this amount 52 percent was appropriated directly to the Geological Survey, 36 percent was made available by other Federal agencies, and 12 percent by States and their political subdivisions.

Obligations incurred by the Geological Survey in fiscal year 1953 (by source of funds)

Topographic surveys and mapping:	
Geological Survey appropriation	$11, 089, 647
States, counties, and municipalities	1, 746, 488
Department of the Interior: Bureau of Reclamation	1, 868, 843
Department of Defense:	
Department of the Air Force	905, 424
Department of the Navy	22, 511
Atomic Energy Commission	186, 749
Mutual Security Administration	21, 835
Miscellaneous Federal agencies	384, 130
Sale of personal property	50, 889
Sale to the public of aerial photographs and photographic copies of records	46, 632
Total	16, 323, 148

Geologic and mineral resource surveys and mapping:	
Geological Survey appropriation	$5, 556, 170
States, counties, and municipalities	217, 852
Department of the Interior:	
Bureau of Indian Affairs	14, 237
Bureau of Reclamation	345, 377
Defense Minerals Exploration Administration	456, 570
Department of Defense:	
Department of the Air Force	19, 441
Department of the Army	1, 036, 849
Department of the Navy	495, 895
Atomic Energy Commission	7, 167, 553
Defense Materials Procurement Agency	79, 477
Mutual Security Administration	490, 802
Miscellaneous Federal agencies	81, 443
Sale of personal property	11, 049
Total	15, 972, 715
Water-resources investigations:	
Geological Survey appropriation	6, 114, 930
States, counties, and municipalities	3, 603, 706
Department of the Interior:	
Bonneville Power Administration	9, 987
Bureau of Indian Affairs	80, 981
Office of the Secretary	5, 000
Bureau of Reclamation	1, 159, 385
Department of Defense:	
Department of the Air Force	69, 012
Department of the Army	1, 108, 396
Department of the Navy	51, 195
Department of State	83, 820
Atomic Energy Commission	183, 321
Tennessee Valley Authority	97, 170
Mutual Security Administration	68, 419
Miscellaneous Federal agencies	406, 773
Permittees and licensees of the Federal Power Commission	70, 153
Sale of personal property	62, 474
Total	13, 174, 722
oil and moisture conservation: Geological Survey appropriation	43, 700
lassification of lands:	
Geological Survey appropriation	359, 743
Miscellaneous Federal agencies	1, 769
Sale of personal property	319
Total	361, 831

Supervision of mining and oil and gas leases:	
Geological Survey appropriation	$1, 020, 999
States, counties, and municipalities	14, 662
Department of the Navy	32, 406
Miscellaneous Federal agencies	5, 842
Sale of personal property	4, 192
Total	1, 078, 101
General Administration:	
Geological Survey appropriation	575, 400
Department of the Interior:	
Bureau of Indian Affairs	3, 710
Bureau of Reclamation	131, 187
Defense Minerals Exploration Administration	15, 200
Department of Defense:	
Department of the Air Force	48, 800
Department of the Army	61, 485
Department of the Navy	21, 267
Department of State	3, 000
Atomic Energy Commission	212, 456
Defense Materials Procurement Agency	2, 650
Tennessee Valley Authority	3, 300
Mutual Security Administration	23, 103
Total	1, 101, 558
Summary:	
Geological Survey appropriation	24, 760, 589
States, counties, and municipalities	5, 582, 708
Other Federal agencies	17, 466, 770
Permittees and licensees of the Federal Power Commission	70, 153
Sale of personal property	128, 923
Sale to the public of aerial photographs and photographic copies of records	46, 632
Grand total	48, 055, 775

NATIONAL PARK SERVICE

Conrad L. Wirth, Director

The 1953 fiscal year will go down in national park annals as one of extremes. Progress on the Independence National Historical Park project; the start of land acquisition at Cape Hatteras National Seashore (the first Federal project of its kind) through the cooperation of both State and private sources; the advance made in rounding out Everglades National Park—these and other achievements make the year notable.

On the reverse side of the ledger is the physical protection and maintenance problem, which steadily gets more serious. The 1952 Annual Report of the National Park Service referred to the "patch-on-patch" method of maintenance in the National Park System which has of necessity been followed for a good many years, as emergency demands for funds and personnel have taken precedence. Now another year has passed and maintenance of the park areas has slipped still more. Facilities have further deteriorated and patching material is scarcer; less protection can be given visitors; and complaints concerning facilities have increased.

As was pointed out in hearings before the Appropriations Committee of the House of Representatives, the Service operated, during 1953, with 25 percent less manpower than it did in the 1941 fiscal year, yet had 10 percent more areas to maintain, far greater responsibilities, and more than twice the number of visitors to be protected and served.

The 1952 calendar year saw the largest travel in the history of the National Park System and now, at the end of the first 6 months of 1953, travel is again soaring. This increased travel still further adds to the workload of providing for visitors; and the facilities are correspondingly reaching a stage of decline where patching will be of no avail.

Therefore, it should be stressed here that, when the overall Federal financial situation will permit, steps should be taken promptly to increase the man-hours of employment to a point where the public can receive adequate protection and assistance; to secure adequate equipment; and to bring facilities and developments necessary for properly safeguarding the parks and the public to a sound basis.

No mention of the manpower shortage would be complete without a tribute to the loyalty of the field employees of the Service, upon whom rests the burden of protection and maintenance. The morale of national park personnel has been a matter of pride through all the years of Service existence, and the men and women engaged in park work will continue to do their utmost in behalf of the parks, the visitors, and the people of the United States to whom the parks belong.

NATIONAL PARK SERVICE CONFERENCE

The Areas Operations Conference, held in Glacier National Park September 4 to 10, was the 21st national park conference. It was a very successful meeting, attended by 158 Service employees, principally superintendents and regional and Washington office personnel. As the name of the conference indicates, its theme was the study of area operational problems and needs, and the working out, where practicable, of solutions of specific problems.

To expedite action, the conference was broken down into six panels, each covering a grouping of allied subjects. The foremen of these panels reported to the general assembly, presenting resolutions for discussion and action. Of the 95 recommendations made by the superintendents relating to the policies and work of the Service, 87 were approved and put into effect, 3 were disapproved, and the others taken under advisement.

During the conference the superintendents' wives were asked to make a survey of housing conditions in the parks, and their report, submitted this spring, revealed some distressing housing conditions for Service employees—conditions that must be improved as rapidly as funds for this purpose can be secured. The wives of Service personnel constitute an important part of the National Park Service itself, and their handling of this survey assignment reflects the intelligent, loyal, and capable character of Service personnel as a whole.

ADVISORY BOARD

The Advisory Board on National Parks, Historic Sites, Buildings, and Monuments continued to give the Service invaluable advice and assistance. The vacancies created by the expiration of the terms of Charles G. Sauers, superintendent of the Cook County (Ill.) Forest Preserve, and Dr. Frank M. Setzler, head curator of anthropology, United States National Museum, on June 30, 1952, were filled early in the fiscal year by the appointment by the Secretary of the Interior of Horace M. Albright, long-time career man with the National Park Service and its director from 1929 to 1933 and now president of the United States Potash Co., and Dr. John O. Brew, director of the Peabody Museum of Archeology and Ethnology of Harvard University. The terms of Dr. Ralph W. Chaney, professor of paleontology of the University of California, and Tom Wallace, editor emeritus of the Louisville (Ky.) Times, expired June 30, 1953. The appointments of Walter L. Huber, civil engineer and conservationist, of San Francisco, and Harold S. Wagner, director-secretary of the Akron (Ohio) Metropolitan Park System, to fill these vacancies were approved, to be effective July 1, 1953.

TRAVEL

The upward trend of travel that has marked the postwar years continued, with 42,299,836 visitors recorded at the end of the 1952 calendar year as against 37,106,440 in 1951. Reports for the first 6 months of 1953 show a 14-percent increase over the same period a year ago, and all indications point to another recordbreaking year. In 1952 the travel year was changed from October 1–September 30 to a calendar-year basis, and records for the preceding 10 years were revised to the same basis for comparative purposes.

In addition to visitors reported above, 5,079,602 users of the metropolitan parks of Washington were recorded during 1952.

Travel surveys.—The Service continued to cooperate with the Bureau of Public Roads and with State authorities in making travel surveys in the national parks. Under such auspices two are currently under way. Fieldwork on the Shenandoah National Park survey, being conducted by the Virginia Department of Highways was completed last October. The analysis of the data obtained by personal interviews with park visitors and the preparation of a report of findings have not yet been completed. Fieldwork on the Yosemite National Park travel survey was commenced in January. The California Division of Highways is participating in the survey. A sampling of winter and spring use, based upon questionnaires executed by park visitors, has been completed. Samples will also be made of summer and fall use.

ACCOMMODATIONS FOR THE PUBLIC

Excellent progress was made during the year in concluding new concession contracts and in auditing concessioners' reports. Although operating with a greatly limited staff—the result of low priorities in job filling—the auditing work is rapidly approaching a current basis, and the progress being made on the elimination of the backlog is even greater than estimated at the beginning of the audit program. The value of Service audits was reflected in the improvement of reports submitted during the year, less than 20 percent being in need of material corrections or additional data as against more than 80 percent 2 years ago.

Contracts.—The Service entered into 17 new concession contracts, including a 1-year operating agreement with the Rainier National Park Co. to operate the facilities in Mount Rainier National Park that were recently purchased by the Government. Five contracts were extended to provide time for contract negotiations or for the study of operating or development problems that must be resolved before new contracts can be prepared. Extensions of two contracts were submitted to the concessioners but had not been accepted by June 30. Preliminary negotiations were completed on 10 proposed new contracts. Fifteen subconcession agreements covering a wide variety of incidental services were prepared.

Boat concessioner, Statue of Liberty.—B. B. Wills, boat-transportation concessioner at the Statue of Liberty National Monument, filed an appeal to the Secretary from the decisions reached after Service audit of his operations. His contract will expire September 30, 1953.

Proposed employment of management consulting firm.—The scope of an industrial and management survey has been defined, so that, if funds can be obtained, a contract can be prepared to complete a study by an outside firm competent to advise on all phases of the concessions program.

Improvements and extensions of concession facilities.—Construction of the largest single concession development since World War I was authorized in a contract between the Grand Teton Lodge & Transportation Co. and the Department of the Interior, to provide visitors' facilities at Jackson Lake Lodge and at Colter Bay, in Grand Teton National Park. During the year construction was begun on the Jackson Lake development. Laurance S. Rockefeller, chairman of the board of the company, has stated that the company will invest $5 million in the development. The Government in turn will expend $1,103,400 for the installation of water, sewer, and electrical distribution lines, campgrounds, and roads and parking areas. The lodge at the south end of Jackson Lake will provide 256 rooms with bath in multiple-room cabins and 46 rooms with bath in the lodge structure, in addition to dining rooms, assembly hall, lobby, large lounge, fountain, and numerous shops. Long-range plans call for the addition to the development of cabins containing 200 rooms with bath. The Colter Bay facilities will include overnight accommodations in cabins, camps, and trailer courts for an estimated 4,000 to 5,000 people. Cafeteria service, stores, and other essential facilities will be provided in this location.

Also important among concession developments were completion of a unit of 30 rooms for visitors at Yosemite Lodge in Yosemite National Park; extensive remodeling of the Glacier Park and Many Glacier Hotels in Glacier National Park; breaking ground for an extension to Volcano House in Hawaii National Park; new construction and remodeling of duplex cabins in Lassen Volcanic National Park; and the beginning of construction on a trailer court at Lake Mead National Recreation Area. This is the first concessioner-operated trailer court to be constructed in an area of the National Park System, but it is believed it should be successful financially and of real service to the public. The first developments at Lake Mead will have approximately 120 trailer sites, with substantial expansion space. These developments and the trailer court to be established in Grand Teton National Park may point the way to similar developments in other park areas.

SAFETY MEASURES

Every effort was made during the year to insure greater visitor safety through careful planning, training of personnel, and cooperation with such agencies as the Public Health Service. There was a small decrease in visitor fatalities, from a rate of 1.13 per million visitors in the 1951 calendar year to 1.04 in 1952. Of the 44 fatalities reported, 18 were from motor-vehicle accidents and 17 from drownngs. These 2 causes have predominated in visitor fatalities during he past 6 years.

Avalanche kills Service employees.—It is reported with regret that wo employees—George H. Beaton and William A. Whitford—lost heir lives in an avalanche that occurred in Glacier National Park n May 1953 while they were working on snow removal on the Going-o-the-Sun Highway.

Park Service employees have participated in Forest Service avalanche-training conferences, in which one of the problems studied s the anticipation of avalanches.

HANGES IN THE NATIONAL PARK SYSTEM

The year 1953 was outstanding in accomplishments toward roundng out the land and water resources of areas of the National Park ystem. Some of the projects on which the Service has been workng for nearly 20 years were either completed or major progress was nade toward completion.

New areas.—Two new areas—Coronado National Memorial in Arizona (2,745 acres) and Fort Caroline National Memorial in Florida (108 acres)—were established. The lands for the Fort Caroline area were purchased with a fund of $37,199 donated by Representative Charles E. Bennett, of Florida, and friends, and with a small supplemental amount of Federal funds.

At the end of the year the National Park System consisted of 175 units, and the Service administered 5 additional areas under cooperative agreements with other agencies.

The land program.—In accordance with the long-range program of acquiring non-Federal lands within approved park boundaries, approximately 83,000 acres of such lands were brought into the National Park System by purchase, exchange, or donation, or were placed under contract for purchase. In addition, some 12,000 acres of non-Federal inholdings were eliminated by a change in boundaries at Badlands National Monument.

Among the major items of the land program were the following: Of the $2,000,000 donated by the State of Florida in 1947 for the purchase of some 390,000 acres of privately owned land in Everglades National Park, about $325,000 remains to pay final awards on a few tracts for which appeals have been entered and to acquire non-Federal lands northwest of the present park but within the boundary authorized by the act of June 30, 1934. Most of the 390,000 acres were acquired prior to the 1953 fiscal year.

At the close of the year agreements had been reached with the State of Montana as to timber value and amount and location of selected grazing lands in eastern Montana involved in the exchange for approximately 9,300 acres of State-owned land in Glacier National Park.

Important progress was made toward completion of land acquisition for the Independence National Historical Park project. The Congress has increased the authorization of funds for this purpose by $3,265,000 to a total of $7,700,000. With these additional funds it is expected that all properties within the project as authorized by the act of June 28, 1948, with the exception of the Irwin Building (a modern office building not at present proposed for acquisition), will be acquired.

All lands within the West Virginia portion of the proposed Harpers Ferry National Monument were tendered to the Federal Government by the State. Maryland has appropriated $40,000 to acquire its portion of the project and is now in process of acquiring some 800 acres.

All but one parcel in Virginia of the lands necessary for establishment of the Cumberland Gap National Historical Park in Virginia, Kentucky, and Tennessee, have been acquired. At the end of the year the three States were about ready to donate to the Federal Government some 20,000 acres for the project. These have been acquired during the past 8 years.

On January 6 the President signed a proclamation adding approximately 47,754 acres to Olympic National Park. These lands are in the so-called Bogachiel strip—a narrow corridor of national forest lands extending into the park—and in the ocean strip and the Queets Corridor, two units which had been acquired by the Federal Government several years before for addition to the park.

The historic Old Stone House in Washington's Georgetown section was acquired by condemnation and purchase at a cost of $90,000, for addition to the National Capital parks.

Some 1,300 acres of important parcels of privately owned lands in various areas of the System, chiefly Glacier and Rocky Mountain National Parks, were purchased.

Approximately 1,400 acres of land for Acadia National Park were donated by John D. Rockefeller, Jr.; 2,000 acres for the Natchez Trace Parkway by the State of Mississippi; 204 acres for Effigy Mounds National Monument by the State of Iowa; and 60 acres for the Home of Franklin D. Roosevelt National Historic Site by the Franklin D. Roosevelt Foundation.

Exchanges, on an equal-value basis, of approximately 9,400 acres in Joshua Tree National Monument, 3,400 acres in Theodore Roosevelt National Memorial Park, and 120 acres in Arches National Monument were effected. In addition, 470 acres in Olympic National Park and 290 acres in Yosemite National Park were exchanged for windthrown or otherwise salvable timber on Federal lands in these parks. The Veterans' Administration transferred 62 acres for addition to the Blue Ridge Parkway. By Presidential proclamation dated November 20, 1952, 81 acres of public domain were added to Hovenweep National Monument.

Cape Hatteras National Seashore project.—Perhaps the most outstanding achievement of the year in the field of land acquisition was the progress made toward fulfillment of the Cape Hatteras National Seashore project in North Carolina. Following the gift of $618,000 by the Avalon and Old Dominion Foundations shortly before the close of the 1952 fiscal year, to match an equal amount provided by the State of North Carolina for the purchase of lands within the approved boundaries of the Cape Hatteras project, the land-acquisition program was pushed vigorously. On December 22, 1952, the State turned over to the Federal Government approximately 6,490 acres of previously State-owned lands. These lands, with the 5,880 acres in the Pea Island National Wildlife Refuge (which is a part of the seashore area) and 44 acres in the former Cape Hatteras Lighthouse Reservation that had been in the custody of the National Park Service, brought the total lands within the Hatteras area in Federal ownership to 12,414 acres. The Secretary of the Interior thereupon instructed the National Park Service to assume jurisdiction of these lands, since the act of Congress establishing the national seashore had authorized the Secretary to accept, for administration, protection, and development, a minimum of 10,000 acres within the authorized boundaries. At the end of the year a large percentage of the approximately 15,000 acres still to be acquired was under negotiation and litigation.

Water resources, rights, and claims.—The Service is attempting, through long-range planning, to secure all essential privately owned rights to water resources in the areas it administers, to assure appropriate protection, and to provide for adequate fresh water for anticipated public use in future years. While the funds appropriated to acquire these privately owned rights have been small, progress was made during the year toward securing essential rights needed for public use.

In the areas administered by the National Park Service there are some 10,500 miles of rivers and streams; and the water surface covers 2,445,200 acres, or about 10 percent of the total area. Throughout these areas there are approximately 350 federally appropriative water rights and more than 300 privately owned rights yet to be acquired.

Special and defense uses of park lands.—On June 30, 1953, approximately 1,600 special-use permits and 52 defense-use permits were in force.

Of the special-use permits, approximately 650 were on the Blue Ridge and Natchez Trace Parkways, 400 on historical areas, and 100 on national recreation areas. They cover primarily small units of land being farmed to maintain historical and rural scenes and vistas and to protect the soil; also continued use of small buildings, minimum access facilities to nearby private properties and justified utility lines.

Of 52 defense-use permits, 11 are for lands and facilities used in World War II. In considering requests for defense permits, the Service was able, apparently without material handicap to the requesting agencies, to prevent uses that would seriously affect park values.

The Atomic Energy Commission's explorations in Capitol Reef National Monument, authorized in 1952, were begun. Field geologists of the Commission also requested permission to explore Big Bend and Grand Canyon National Parks and Petrified Forest National Monument for uranium. Permission was given for the survey of Big Bend with Geiger counters; the other requests are currently under study.

RECREATIONAL OPPORTUNITIES

In its cooperation with other agencies, the National Park Service works closely with the Army Corps of Engineers and the Bureau of Reclamation in appraising the recreational value of reservoirs built by these two agencies. To insure that reclamation projects will provide for the development of recreational opportunities, the basic plans of all major reclamation projects include provisions for outdoor recreation where there is a national interest.

Virtually every reservoir built today is stocked with fish through the cooperation of State authorities or agencies of the Federal Government. Similarly, these man-made lakes offer opportunities for boating, bathing, and picnicking. This extra recreational resource has a very substantial economic value in addition to the intangible values of health and human enjoyment.

DAM SITES

Renewed efforts were being made to have authorized the Mining City Dam on the Green River in Kentucky, which probably would cause extensive flooding of portions of Mammoth Cave. Cooperative efforts of the Geological Survey and the National Park Service resulted in undertaking a preliminary hydrological survey of these subterranean waters, but results are, as yet, too meager to determine what the full impact of a dam at the Mining City site would be.

In the meantime, the Corps has concentrated its efforts on studies of flood control and navigation structures downstream from the Minng City Dam site, which would not affect the protection of the park.

Groups in the Northwest reactivated the plan to construct Glacier View Dam, a project which would flood nearly 20,000 acres of Glacier National Park. In Florida, efforts were underway by land and oil nterests to block the authorized additions to Everglades National Park. The Service is making further scientific studies of the lands n question to determine whether boundary adjustments would be in the public interest.

RIVER BASIN STUDIES

The Service continued its cooperation with the Bureau of Reclamation and the Corps of Engineers in planning for the recreation development of reservoir areas. Twenty-two reconnaissance and planning reports and 39 preliminary field surveys and investigations were made for the Bureau and the Corps. Intensive studies were made in cooperation with interagency committees, consisting of representatives of Federal resources planning agencies and the States, to work out plans for the comprehensive resources development of the Missouri, Columbia, Central Valley, and Arkansas-White-Red River Basins, and the New England-New York region.

At the suggestion of the Congress, and in the interest of economy and expediency, the Service enlisted the aid of educational institutions in compiling and analyzing existing recreation facilities within these major basins, the recreation habits, preferences, and needs of the people, and the economic effect of recreation on local communities. Research contracts were made with the University of Oklahoma, the National Recreation School, the Bureau of Business Research of the University of Washington, the University of Florida, and the Statistical Laboratory of Iowa State College. Results of these studies, which will be completed within the next 2 or 3 years and which then will have covered approximately half of the continental United States, will be invaluable in formulating the national recreation plan which the Service was authorized and directed to develop pursuant to the Park, Parkway and Recreational-Area Study Act of 1936.

RESERVOIR MANAGEMENT PLANNING

The Service continued to act as agent for the Bureau of Reclamation in negotiating agreements with State, county, and local agencies for the administration and maintenance of reservoir recreation areas of less than national significance. Progress in this direction during the year included the negotiation of agreements with the State of Washington for four reservoirs, the largest of them being the Equalizing Reservoir of the Columbia Basin project. Cachuma Reservoir, in California, was turned over to the county of Santa Barbara, and South Dakota took over the administration of Shadehill Reservoir. At the end of the year negotiations were progressing satisfactorily for local management of several units of the Colorado-Big Thompson project, and efforts to interest the States of Wyoming, Montana, and California in the administration of reservoir recreation areas were meeting with promising response. The addition of these 3 States to the roster of Western States administering resorvoir recreation areas will bring 9 of the 17 Western States into active participation in the reservoir recreation-area management-planning program.

STATE AND TERRITORIAL COOPERATION

The Service continued to assist other Federal, State, and local agencies concerned with parks and recreation by (1) serving as a central clearinghouse for information, (2) working with other agencies such as the National Conference on State Parks, American Institute of Park Executives, American Camping Association, Great Lakes Park Training Institute, and the Federal Inter-Agency Committee on Recreation, and (3) furnishing advisory and consultative assistance to the States upon request.

State Park Statistics, 1952, issued during the year, contains tabulations of State park expenditures, sources of funds, attendance, personnel, and land acquisition. The American Planning and Civic Association, under contract with the Service, undertook to bring up to date the 1936 Digest of Laws Relating to State Parks. Under provisions of an agreement approved by the Assistant Secretary on January 22, the Service cooperated with the Bureau of Land Management in studies to determine the scenic, scientific, historical, archeological, and other recreation resources on public lands and in preparation of plans for their protection, utilization, and administration.

The Alaska Recreation Survey, initiated in 1950, is now about 80 percent complete. The first volume of the covering report, Part I, Volume I: Economic Aspects of Recreation in Alaska, was issued in the spring of 1953. An extensive study of passenger travel, with special reference to tourists, was completed by the University of Washington under contract; a survey of community recreation in Alaska was made by the National Recreation School, also under contract.

An appraisal of the scientific values of Katmai National Monument is under way this summer, in cooperation with the Office of Naval Research Office of the Quartermaster General, Geological Survey, Public Health Service, and several universities. A somewhat similar study of an Arctic wilderness area north of the Brooks Range and extending east to the Canadian border was also initiated in cooperation with the Office of Naval Research and the Geological Survey.

FEDERAL REAL-PROPERTY DISPOSAL

Twelve applications for the acquisition of surplus Federal lands for public park, recreation, and historic monument use were processed by the Service during the year under provisions of the act of June 10, 1948. This act provides that the Department of the Interior shall cooperate with the General Services Administration in the disposition of such lands to State and municipal agencies. Since the program was inaugurated, 43 applications have been processed. These have involved 27,561 acres of land and 585 buildings. A total of $1,234,349 has been returned to the United States Treasury under this activity.

COMMUNITY PLANNING

A master plan and report were prepared for the Folsom Reservoir and environs, in California, at the request of the Tricounty Planning Commission. The report included a master plan for a 100-square-mile district which contains portions of 3 counties. Recommendations consisted of a proposed highway and recreation plan as well as suggested zoning, subdivision control, and building code regulations.

A report on Park and Recreation Areas, Territory of Guam, was prepared at the request of the Governor of Guam. This report contains detailed recommendations for school playgrounds, parks and parkways, waterfront development, reforestation, and a statute for the protection of natural and historic sites and archeological remains.

At the request of the city manager of Boulder City, Nev., three subdivision plans were prepared for the extension of the town. Also, a zoning map and ordinance and subdivision regulations were prepared and discussed with the local planning commission.

Planning consulting service was given upon request by the Department of Conservation of Kentucky for the improvement of the State capitol grounds and other State building sites in Frankfort.

An interim zoning ordinance for Harpers Ferry, W. Va., was prepared at the request of Mayor Gilbert E. Perry to protect the environs of the national monument being established there.

IN THE NATURAL-HISTORY FIELD

The need for interpretive services in areas of primarily scenic-scientific interest continued to expand. In the 1952 calendar year, interpretive activities in 53 such areas served 17,143,947 people, compared to 14,451,996 in the 1951 fiscal year. The word "people" is used here in the sense of "contacts," since some people received naturalist services of one type or another at several points in a park or in several parks.

Visual aids and self-guiding devices were increasingly used to supplement personal services which, through lack of sufficient personnel, could not be extended to all interested individuals. In Shenandoah National Park, for instance, the two-man naturalist staff could make personal contact with a very small percentage of the million and a half visitors to that area.

Visual aids in interpretive program.—During the year semiautomatic orientation slide talks were presented at Wind Cave, Acadia, and Crater Lake National Parks and Bandelier National Monument. To further natural and historical interpretation, three slide talks with accompanying manuscripts were developed.

Copies of 2 motion pictures of Dinosaur National Monument and of 1 film of Hawaii volcanic activity were acquired for addition to the extremely limited film supply in the Washington office. Other films produced independently or in cooperation with the Service that emphasize the natural values of park areas include the Lange film on Mount Rainier National Park, the Couillard film on Great Smoky Mountains National Park, and Olympic Elk, Bear Country, and Prowlers of the Everglades, released or completed during the year by Walt Disney Studio as part of the True Life Adventure Series.

Wildlife investigations.—Conditions on the northern winter range in Yellowstone National Park and in the Gallatin drainage were kept under surveillance. In both areas elk have been far too numerous for many years. An investigation was continued into the food habits, migrations, distribution, and other characteristics of the Roosevelt elk in Olympic National Park. Studies of elk movements in and around Grand Teton National Park were continued in cooperation with the Wyoming Game and Fish Commission, as required by Public Law 787. Checks were made on the use of the range by bison at Wind Cave and Yellowstone, and on bison damage to thermal features in the latter area.

Information on the trend of white-tailed deer populations in and around Acadia National Park was kept current. Studies of the effect of mule deer on forage plants in Mesa Verde and Zion National Parks were continued by the Fish and Wildlife Service. In the latter park, systematic data on movements of deer to and from winter range on the floor of Zion Canyon were obtained for the first time by the local staff.

Close watch was maintained on the bighorns of the northern part of Yellowstone National Park, where too many of these animals are in poor condition. For the second successive year, weather conditions thwarted attempts to make an aerial census of Dall sheep in Mount McKinley National Park. However, all evidence indicates that the lamb "crops" were good and survival of younger animals over the winter was high. A study was made of the moose of Isle Royale National Park, with special reference to the food supply. Information also was obtained regarding the numbers, distribution, and habits of the small population of wolves in this island park. More data were obtained on the life history and movements of the cougar of Olympic National Park.

Biological investigations were made of Katmai National Monument and of a proposed wilderness reserve in northeastern Alaska.

Studies were made of prairie-dog colonies in Wind Cave National Park and Theodore Roosevelt National Memorial Park. With the aid of other Government agencies, considerable information was gathered on recent records of the black-footed ferret.

With the cooperation of the Fish and Wildlife Service in supplying a plane and pilot, an aerial count of trumpeter swans was made in Yellowstone National Park and vicinity. The count of 74 adults and 17 cygnets was approximately the same as had been secured for several years.

Wildlife and food supply.—The national parks and more extensive national monuments are preserved as natural areas and wildlife populations are treated in conformity with this policy. In several instances, however, loss of normal biological controls has forced the National Park Service to introduce management measures. In this category is the northern Yellowstone elk herd, which entered the past winter with about 9,600 head, although the carrying capacity of the winter range probably is less than 5,000. The mild season allowed the elk to forage at unusually high elevations, and hunter kill north of the park was estimated at only 100 animals. During late winter, only limited trapping in the park was practicable and 166 elk were shipped for restocking 5 areas in Montana. Requests for 77 additional animals had to remain unfilled. This strengthens previous conclusions that live trapping is not the answer to the problem.

Control measures to restore the limited winter range in the Estes Park region of Rocky Mountain National Park were continued. At Wind Cave National Park the bison population was reduced to 400 head when 150 animals were driven into the adjoining Custer State Park and butchered by State officials, who stored an agreed portion of the meat for use during the year by Indians. Attempts to deal in a similar manner with a large excess of Wind Cave elk were unsuccessful.

Elk control under Public Law 787.—Again last year areas in the northern portion of Grand Teton National Park were opened to controlled reduction of elk. The Wyoming Game and Fish Commission desired a kill of 600 elk in the park, and 1,200 "openings" of deputy park rangers were established for applicants who held Wyoming hunting licenses. Ten hundred and fifty-five hunters applied to the State and were deputized, but only 455 applied for park permits. They killed only 27 elk—a minor contribution to the total kill of about 3,500 elk for the herd as a whole.

Wildlife restoration activities.—New outbreaks of the foot-and-mouth disease in Mexico resulted in renewal of the ban on importation of cloven-hoofed mammals from that country and thus interfered with the progress of reestablishing bighorns in Big Bend National Park. Four donated wolves were released in Isle Royale National Park in aid of conservation of a vanishing species. The animals, however, had been too long in confinement, and it became necessary to remove three of them. Meanwhile, the presence of wolves that had reached the park by natural means was detected.

Bat-banding project.—A banding project was started at Carlsbad Caverns National Park in an attempt to get authentic information as to the habits of the Mexican free-tailed bat. One bat so banded was recovered in Atingo, Mexico. According to the Fish and Wildlife Service, this is the longest recovery recorded for a banded bat.

Wildlife policies questioned.—The "no hunting" policy which has reserved wildlife in the National Park System for the camera "hunter" and for general public enjoyment under natural conditions came under considerable fire. The International Association of Game, Fish, and Conservation Commissioners has studied legislation to require that surplus wildlife must be destroyed, when necessary, by State-licensed hunters only. Another organization is studying the advisability of public hunting as a means of solving the northern Yellowstone elk problem; and the Wyoming Legislature has memorialized Congress to permit hunting of elk in Yellowstone National Park under direction of the Wyoming Game and Fish Commission. Efforts are being exerted to admit hunters to Great Smoky Mountains National Park to kill bears when the latter are believed to have molested livestock outside the park.

Even the smaller animals are threatened. The South Dakota State Legislature has requested that prairie dogs "and similar undesirable animals" be exterminated from the national parks. In normal numbers, these animals are important in the preservation of the historic scene, are indispensible to a healthy native plant and animal community, and are of unfailing interest to visitors. Conservation organizations unanimously endorse the basic policies established by the Congress of preserving the parks and the wildlife therein.

National park fisheries.—Angling pressure continued to increase in most of the parks, and in a few cases further restrictions were imposed to preserve the basic stocks of fish. One of the most serious problems concerns the black-spotted trout of Yellowstone Lake and its tributaries. Continued studies by the Fish and Wildlife Service revealed a further decline in the fish population, in spawn production, and in angling success. In order to reverse this trend, both season length and creel limits were reduced. A larger escapement of trout for natural spawning has been permitted and few eggs are being collected for artificial propagation.

Stocking is declining in importance as a means of maintaining good fishing. In 1952, only 5,637,000 fingerlings and 721,000 fry and eyed eggs, mostly furnished by the States, were planted in the waters of 15 areas administered by the National Park Service. About 25 percent fewer fish will be planted in Glacier, Yellowstone, and Yosemite National Parks in 1953.

An intensive fish investigation in Yosemite National Park was made possible through a donation of $2,500 by Mrs. Mary Tresidder. The investigation of all the principal waters of the park may be a guide for studies elsewhere.

Geologic studies.—Liaison was maintained with the Geological Survey, the National Museum, State geological bureaus, and various institutions, organizations, and individuals interested in or engaged upon geological, mineralogical, or paleontological investigations within the

National Park System. Significant accomplishments in this field were (1) completion of geological field studies in Great Smoky Mountains National Park, (2) major progress in aerial mapping and groundwater investigation of Carlsbad Caverns National Park, (3) initiation of hydrological and sedimentation investigations at Mammoth Cave National Park, (4) furtherance of geomorphic studies in the Grand Teton-Jackson Hole region, and (5) the setting up of major geological investigations in Katmai National Monument.

HISTORY AND ARCHEOLOGY

The Service continued its efforts to give maximum protection to the historic areas under its jurisdiction, to the end that the people of the United States might see and enjoy the places and sites that form a living history of this portion of the continent going back far into prehistoric times. The two new areas added to the System in the 1953 fiscal year, mentioned elsewhere, both were of historical significance.

The 123 historical and archeological areas in the National Park System reported a total of 15,670,874 visitors, over 8,000,000 receiving some form of personal assistance from Service personnel.

To complement the limited personal services available to this record-breaking group of visitors, audiovisual aids were used. These consisted of such aids as films, recordings, automatic recording and projecting auditory machines, and magnetic tapes synchronized with automatic slide projectors. A new synchronized tape and slide projector was installed in the museum building at Morristown National Historical Park to assist visitors to visualize and understand this historic area, once Washington's headquarters. A similar tape and slide presentation was used at Bandelier National Monument. At the Washington Monument in the National Capital a new type of compact automatic recording and projecting machine was installed to give a brief welcome and explain the significance of this great shaft. A recorded talk was prepared for use in the public-address system on the boat that carries visitors to the Statue of Liberty National Monument.

Donations.—Again space is lacking to acknowledge individually the many other gifts from public-spirited citizens of museum pieces, authentic furnishings for historic houses, books, manuscripts, pictures, and funds received during the year. Of special importance were the following: The noted Lloyd W. Smith collection of books, manuscripts, works of art, and other historic objects relating to the American Revolution, donated to Morristown National Historical Park by Lloyd W. Smith (upon condition that the Federal Government arrange for suitable housing and display of the collection); $35,000 offered by Glass Crafts of America for the reconstruction of the glass factory used by the early settlers at Jamestown and for its interpretation to the public; and the W. C. Storrick Civil War collection of over 200 volumes pertaining primarily to the Battle of Gettysburg, which was donated to the Gettysburg National Military Park.

Preservation and protection.—Preserving the historical areas of the Service from undesirable encroachments requires constant vigilance. Fortunately the threat to Manassas National Battlefield Park was partially alleviated by the appropriation of $50,000 by the State of New York for the purchase of needed lands in the area of the New York monuments. This sum is now being expended to good advantage.

The Service has gone forward with condemnation of lands in the historic Redoubt 10 area in the heart of the Yorktown Battlefield. It has also refused an access road to private interests at Guilford Courthouse National Military Park, where American troops took their final stand during the battle of March 15, 1781, since such a road would hinder the park program. Despite Service effort to prevent it, at the close of the year there was still an imminent possibility that industrial use would be made of the area between the two separated parts of Chalmette National Historical Park. This would divide the park permanently and destroy the heart of the battlefield.

Historic Hampton structure acquired.—A gift of $14,000 from the Avalon Foundation made possible the purchase of a small tract of land and two carriage houses or barns to be added to the Hampton National Historic Site. These structures were needed both to complete the historical picture of life at Hampton and to protect the historic site from undesirable encroachments. Part of the donated funds will be used to stabilize the carriage houses.

Restoration, stabilization, and rehabilitation.—The historic Burnside Bridge at Antietam National Battlefield Site, which partially collapsed in January, was promptly repaired and stabilized. The General Schuyler House, a part of Saratoga National Historical Park, was repaired and rehabilitated. A local patriotic group has offered to undertake the task of furnishing this building and interpreting it to visitors.

Ruins stabilization was conducted at Mesa Verde National Park and Hovenweep, Aztec Ruins, Chaco Canyon, and Wupatki National Monuments at a combined cost of $46,500. The historic Mormon fort at Pipe Spring National Monument was rehabilitated, and minor repairs were made at Tumacacori National Monument.

In the East, rehabilitation of the Hopewell Furnace Works was continued, and work commenced on the rehabilitation of the courtyard and interior of Castillo de San Marcos. Other repair work was done on the Old Custom House and the Hawkes House at Salem Maritime National Historic Site, on Fort Sumter, and on pioneer structures in the Great Smoky Mountains National Park. The cost of this work in the East was approximately $76,000.

Assistance in safeguarding our national heritage.—During the past year the Service appraised the historic value of numerous places suggested as of national importance in the historic scene. Five such proposals were handled on behalf of the President, 28 involving 23 historic areas on behalf of Members of Congress, and 53 involving 46 areas suggested by individuals or patriotic organizations. Preliminary historical studies were also made of 43 congressional bills involving 34 proposed historic areas or memorials, and in many cases assistance was given in the preparation of reports to committees of the Congress. These involved both research and field studies. In addition, historical data were collected in connection with 36 bills directly affecting the Service of the historical areas in the National Park System.

With the assistance of Representative Charles E. Bennett, of Florida, the Service arranged a joint land and underwater survey and archeological salvage program of the site of the French settlement of 1564 at Fort Caroline on the St. Johns River. The Office of the Chief of Naval Operations supplied ships and divers for the underwater phases of the project, and the National Park Service handled the archeological work on land. The study indicated that the St. Johns River has destroyed the site and that memorial and museum treatment of the fort alone is possible. Establishment of the memorial is reported elsewhere.

Historic preservation in time of armed conflict.—Following receipt of a proposed International Convention for the Protection of Cultural Treasures in the Event of Armed Conflict, prepared by a conference of experts in Paris July 21 to August 14, 1952, discussions were held on this subject and other matters relating to the protection and preservation of historic sites, buildings, and objects with Dr. Van der Haagen, head of the Museum and Monuments Division of UNESCO. The next step will be consideration of the final draft of the proposed treaty, early in 1954, by an International Conference, to which Holland will act as host.

Cooperation was given the Department of State in connection with plans for assisting Israel, Lebanon, and Jordan in the preservation and interpretation of their historic heritage.

Historical field studies.—A number of important historical research studies, basic to the adequate physical or interpretive development of many areas in the National Park System, were conducted. Among these were studies in relation to the Spanish Colonial Period of

American history, which touches many Service areas; the English Colonial Period, which ranges from Jamestown Island in Colonial National Historical Park to Fort Necessity National Battlefield Site; the Revolutionary War Period, including Independence National Historical Park project; the Civil War; commerce, industry, and agriculture to 1890; means of travel and communication, as exemplified at the Natchez Trace National Parkway; and the arts and sciences.

Archeological field studies.—Exceptional discoveries in the field of archeology were made in the areas of the National Park System. At Fort Necessity the remains of the original stockade erected by George Washington and burned by the French and Indians in 1754 were unearthed and positively identified. A series of studies at Fort Frederica disclosed much information on the original shape and details of the fort and further data on the town layout and town gate. The most recent discovery was of the foundation remains of the house of Benjamin Franklin at the Independence National Historical Park project.

Additional investigations yielded data on the presumed location of George Washington Carver's birthplace. Explorations were continued at Effigy Mounds National Monument and Isle Royale National Park to reveal the identity of prehistoric Indians there. Excavations in Grand Canyon National Park unearthed a small pueblo ruin on the edge of the canyon. Surveys and limited excavations were conducted at Mesa Verde National Park and Bandelier National Monument. The series of important archeological investigations at Fort Vancouver was concluded, but the Service continued to cooperate with the Washington State Parks and Recreation Commission in explorations of the sites of Fort Spokane and Fort Okanogon.

The National Park Service has continued to encourage utility companies to obtain assistance from research institutions in salvaging irreplaceable historic and archeological sites which occur in their construction projects. For example, the Service obtained excellent cooperation from the El Paso Natural Gas Co. for further salvaging of sites along its new Big Inch projects; and the Power and Utilities Engineering Bureau at San Francisco was assisted in cooperating with the University of California in archeological salvage work in Cherry Valley.

River basin archeology.—The Service continued to cooperate in the interagency archeological salvage program in conjunction with the Smithsonian Institution and other Federal and State agencies, including universities. Studies in the Missouri Basin by the Smithsonian and other cooperating agencies made valuable contributions to prehistory and frontier history which materially advanced knowledge of human occupation of the Great Plains.

The University of California contracted with the Service for investigations in the Nimbus and Red Bank Reservoirs in California; the Florida Historical Society contracted for a historical survey and the Florida State Museum for archeological excavations within the Jim Woodruff Reservoir in Georgia and Florida; and the University of Washington and the University of Oregon both have contracts calling for excavations in the Dalles Reservoir. Most of this work is programed for the current summer excavation season, and discoveries which greatly advance knowledge of cultural origins have already resulted. The Service also employed field archeologists to make investigations in the Dalles Reservoir and the Falcon and Whitney Reservoirs of Texas; to survey the Hartwell Reservoir in South Carolina; and to excavate in the Jim Woodruff Reservoir. The Hudson's Bay Post of Fort Walla Walla, near present day Wallula, Wash., will be flooded in June by waters back of McNary Dam. Prior to its final disappearance the old fort was excavated by National Park Service archeologists and others. Whitman National Monument has many artifacts from the fort, and a very fine collection of English chinaware, mostly Spode, is temporarily housed at Whitman College pending development of a museum at the monument.

Technical advice in military history field.—The Service continued to furnish technical information and advice in the field of military history to Federal, State, local, and private organizations. Fourteen requests for such assistance were received from State agencies, 26 from other Federal agencies, and 15 from private organizations. The requests ranged from identification of individual specimens in museum collections to advice for the Bureau of Internal Revenue on the classification of antique firearms for tax purposes; and from questions about bibliographic reference to the review of historical studies written for the Department of the Army and the preparation of plans for reconstructing cannon and carriages for the first fort at Plymouth. One of the organizations receiving such assistance was the Arms and Armor Society of Great Britain.

HISTORIC AMERICAN BUILDINGS SURVEY

New impetus was given to the Historic American Buildings Survey through the Committee on Preservation of Historic Buildings of the American Institute of Architects. Each chapter of the institute will appoint a preservation officer who will list all historic buildings in the area in which the chapter is located. Forms and instructions for listing such buildings with pertinent information concerning their history and former occupants have been prepared by the Service in collaboration with the National Trust and the AIA. The preservation officers also will advise individuals and organizations on restoration of historic buildings and will assist in their preservation. Active recording of historic buildings through measured drawings and photographs was suspended at the beginning of World War II.

MUSEUM ACTIVITIES

The Service, through its Museum Laboratory, carries on a dual program of preservation and rehabilitation of scientific and historical collections and of museum exhibit construction. The list of items given preservative treatments in 1953 is much too long for a report of this nature. Important preservation work was accomplished on valuable paintings at Independence National Historical Park project, Hampton National Historic Site, and Castillo de San Marcos National Monument; also on numerous metal, leather, wood, paper, and cloth objects at 16 other museums or houses.

The outstanding exhibit construction was the preparation of the 15 exhibits installed in the Zenger Memorial Room at Federal Hall Memorial National Historic Site, mentioned elsewhere. Exhibit construction was performed for 14 other areas and, at the close of the year, was in progress for the United States Marine Corps and for he State of Louisiana. Advice on museum planning was furnished o the States of Florida, Kentucky, and West Virginia.

DEDICATIONS, CELEBRATIONS, AND PAGEANTS

The Peter Zenger Memorial dedicatory ceremonies were held April 23 in the rotunda of Federal Hall in the presence of leaders of the Zenger Memorial Fund, Inc., the Federal Hall Memorial Associates, Members of Congress, and interested citizens. Arthur Hayes Sulzberger, who had taken an active part in the movement to establish he memorial, made the dedicatory address on behalf of the Zenger Fund and presented the memorial room to Hon. Orme Lewis, Assistant Secretary of the Department of the Interior, who accepted t on behalf of the Federal Government.

A joint international peace memorial service was held at Perry's Victory and International Peace Memorial on June 21 by the Ontario Provincial Command of the Canadian Legion, BESL, and the Ohio Command of the American Legion in honor of the 3 British and 3 American officers killed in the Battle of Lake Erie and buried in a ommon vault in the floor of the rotunda of the memorial shaft. Secretary of the Interior Douglas McKay, Maj. Gen. E. L. M. Burns, Deputy Minister of Veterans' Affairs of Canada, and Hon. John Brown, Lieutenant Governor of Ohio, were the principal speakers.

Another colorful celebration was held on November 19, 1952, when the Western Maryland Railroad, in observance of its centennial year, presented a historical pageant depicting Lincoln's visit to Gettysburg on November 19, 1863, when he presented his famed address. Part of the pageant was held in Gettysburg National Cemetery.

Pageants presented with success in historical areas included The Lost Colony, at Fort Raleigh National Historic Site; the Sword of Gideon, a revolutionary drama, at Kings Mountain National Military Park; and the Hiawatha Pageant at Pipestone National Monument.

CONSTRUCTION AND IMPROVEMENT

As explained to the Appropriations Committee of the House of Representatives, on June 30, 1953, the Service had an overall backlog of needed new construction projects and of urgent rehabilitation and maintenance of existing facilities equivalent to many times its annual appropriation. With continually increasing visitor use, the sum needed for construction and maintenance will mount.

Meanwhile every effort has been made to improve operating, construction, and maintenance methods to achieve maximum efficiency at the least cost. To this end, road and trail maintenance was contracted where possible and economically desirable; experiments were continued toward disposal of waste and refuse through mechanical means to provide more efficient disposal at reduced cost; and negotiations were undertaken with commercial firms for the provision, on a contract basis, of power and communications facilities.

FM radio field surveys were conducted at Great Smoky Mountains, Yellowstone, and Yosemite National Parks. Further work is being held in abeyance pending the outcome of negotiations with potential contractors. The radio systems under construction at Dinosaur National Monument and Sequoia and Kings Canyon National Parks are available for partial use. During the year, negotiations were under way for the furnishing, by subsidiaries of the American Telephone & Telegraph Co., of radio and telephone services in Shenandoah, Great Smoky Mountains, Big Bend, Sequoia, Kings Canyon, Yosemite, Mesa Verde, Yellowstone, Grand Teton, Carlsbad Caverns, and Glacier National Parks.

Good progress was made in negotiating contracts for supplying electric power to Everglades, Sequoia, Kings Canyon, Yellowstone, and Glacier National Parks. Contracts have been executed to supply Big Bend and Grand Teton National Parks with electric power.

Parkway development.—Parkway funds again were concentrated on the Baltimore-Washington Parkway, this high-priority defense project receiving $8,250,000 of the $9,605,000 available for the parkways program. Of this amount, $1,500,000 represented contract authorization provided by the Federal Aid Highway Act of 1952. This emphasis on the Baltimore-Washington Parkway caused curtailment of much-needed construction on the seven other authorized national parkways.

The Federal portion of the Baltimore-Washington Parkway probably will be completed by the late fall of 1954. Units of the parkway will be opened to traffic as soon as they are completed, with some sections possibly ready for use late in 1953. During the 1953 fiscal year, contracts totaling $6,307,054 were awarded or were in process for projects that include 7.7 miles of grading and draining, 4 grade-separation structures, 1 bridge over the Anacostia River, and 10 miles of concrete paving.

A contract was awarded for the grading of the 4-mile gap in the Blue Ridge Parkway on section 2U in North Carolina which, when completed, will make an 11-mile section of the parkway available for public use in the vicinity of Asheville. Work was started on the development of the Linville Falls Recreational Area on the parkway.

The Maryland Legislature approved the acquisition of the necessary right-of-way by the State for the construction of that portion of the Chesapeake & Ohio Canal Parkway between Cumberland and Hancock.

Paving of the Colonial Parkway through the Williamsburg Tunnel and the connection of the parkway with Tazewell Hall Avenue in Williamsburg was completed. Every effort is to be made to complete the Williamsburg-Jamestown portion of the parkway in time for the celebration in 1957 of the 350th anniversary of the founding of Jamestown.

Three bridges were completed and grading and draining is well under way on the southbound lane of the 1.6-mile Gatlinburg-Banner Bridge portion of the spur road between Gatlinburg and the main line of the Foothills Parkway at Caney Creek.

The road base of the Mount Vernon Memorial Parkway is deteriorating badly under the heavy use of almost 30,000 cars and buses a day. A large-scale reconstruction project appears to be the only solution. It is estimated that the first unit of this proposed construction work between the south end of the National Airport and the city of Alexandria will cost $750,000. Right-of-way either has been acquired or is in process of being acquired through condemnation for the extension of the parkway from its present ending at Spouts Run to Chain Bridge. The construction of this section is in top priority on the Virginia side of the Potomac River. On the Maryland side, the construction of the portion of the parkway between the District of Columbia line and Carderock, Md., is of the highest priority. This would extend the parkway from the District line to beyond the Navy's David Taylor Model Basin.

On the Natchez Trace Parkway, work was under way on the grade separation structure at Mississippi Highway No. 35, which is the only gap in the 64-mile paved portion of the highway. Thirty-four miles of the parkway in Tennessee and Alabama now are ready for paving and will be the first paved units in these States. Funds are included in the 1954 budget for this paving. The Ridgeland Information Station, the first on the parkway, was opened to public use in March 1953 with appropriate ceremonies. Twenty-two miles of additional right-of-way for the Mississippi portion of the parkway were deeded by the State to the Federal Government.

Two additional lanes on the Suitland Parkway, between the District's South Capitol Street Bridge and Silver Hill Road in Maryland, have been paved.

Bureau of Public Roads construction.—More progress was made in providing needed road construction in 1953 than in any other year since World War II. Major road improvements completed totaled 101.3 miles, at a construction cost of nearly $4,300,000. The road construction under way on June 30, covering 24.2 miles of road, parking areas, and bridge structures, represents an expenditure of $2,190,156. The most outstanding road-replacement project was the Moran-Yellowstone Approach Road in Grand Teton National Park, initiated in 1950 to replace a narrow, winding road north of Moran Junction. Completion of this scenic drive along Jackson Lake will facilitate traffic movement between the two parks. Other completed reconstruction jobs were the Cades Cove Road in Great Smoky Mountains National Park, a 10-mile section of the mile-high Trail Ridge Road in Rocky Mountain National Park, the Going-to-the-Sun Highway section between Logan Pass and Mount Cannon in Glacier National Park, and the Lassen Peak Highway in Lassen Volcanic National Park. Completion of grade-separation structures made available an entrance road from the northeast boundary of Acadia National Park to the main east-side loop road.

Buildings and utilities.—Construction was completed on many needed utility buildings, comfort stations, and ranger stations in Great Smoky Mountains, Big Bend, and Glacier National Parks; on an administration building in Boulder City for Lake Mead National Recreation Area; and on numerous employees' residences and other buildings in Big Bend, Glacier, and Yellowstone National Parks; Lake Mead National Recreation Area; Saguaro, Statue of Liberty, Chaco Canyon, and Badlands National Monuments; and Chickamauga and Chattanooga National Military Park.

A steam distribution line constructed at Independence National Historical Park project will furnish a central steam supply to buildngs in the area, including Independence Hall and Carpenters' Hall. hrough discontinuing individual heating plants, a serious fire hazard vas removed.

When work under the present contract is finished, restoration of the xterior of the fort at Castle Clinton on the Battery in New York vill be completed. Interior work also is necessary as funds become vailable.

At Perry's Victory and International Peace Memorial National Monument the 350-foot memorial shaft, which had had virtually no maintenance since its erection in 1912, was completely rehabilitated. Exterior masonry joints were repointed, masonry and tile cleaned, he interior lining repaired, the rotunda dome cleaned, and the bronze oor to the observatory gallery replaced. Conditions discovered in he rehabilitation of this shaft indicate forcibly the need for periodic epointing about every 20 years; otherwise there is danger of irreprable damage to the basic structure.

Road and trail maintenance by contract.—To keep to a minimum he size of permanent crews engaged in road and trail maintenance n areas administered by the National Park Service, to obviate the ecessity of recruiting temporary employees therefor, and to provide dequate road and trail maintenance, this work was contracted for in elected areas on an experimental basis. Removal of down trees in lympic National Park and initial opening of several hundred miles f trails was accomplished under 26 contracts. As a result, trails in he area were open for public use much earlier than when the work performed by the park trail-maintenance crew, the logistics of suply was eliminated, and the work was performed at a lower unit cost. he success of this method of trail maintenance is dependent upon close roximity to commercial logging activities, but is being encouraged herever practicable. Similarly, road maintenance on the Blue Ridge arkway and center-line striping of roads in several parks have been ccomplished under contract at considerable savings.

Portable rock crusher reduces trail-maintenance costs.—In the past, he production of suitable trail-tread material has been unduly exensive, since usually material is not available locally and has to be acked to the trail site, about 200 pounds per pack animal. This year, n cooperation with commercial rock-crusher manufacturers, a small ortable rock crusher was successfully developed and put into service produce tread material for Grand Canyon National Park trails. his gasoline-engine-driven unit breaks down into components of less han 200 pounds that can be transported by pack train. It has reulted in appreciably reducing trail-tread material costs.

Sanitation studies.—The Service inaugurated a far-reaching su vey of all features of sanitation, including cost and time studies c garbage and trash collection and methods of disposal. Comparisor will be made of the cost of disposal by mechanical means, such a large stationary and portable grinders and household garbage grinc ers and incinerators, as against the sanitary land-fill methods. Lal oratory tests will be made to determine the value of newsprint an paper trash for mulching, as this seems to be the predominant ma terial used to charge the machines. Cost studies will be undertake with mechanical equipment at a permanent location and as a port able vehicle where areas need mulch residue. Soil tests will be mad at selected treated locations to determine the acid and other elemen values. The first field study will be initiated at Shenandoah Nationa Park.

Trailer accommodation study.—A special study was undertaken t determine how best to meet the growing demand for modern traile accommodations in national parks. After preliminary informatio was obtained from officials of the Trailer Coach Manufacturers Assc ciation, a Service staff member was assigned to make a trailer trip t study the layout and operating methods used by trailer court opera tors and to gage public reaction to the facilities and services offerec The final report will cover general problems such as trailer spac requirements, adequate circulation and parking, individual utilit connections, laundries, showers, comfort stations, and similar facili ties. The tentative solutions to the general problems then must b adapted to special park conditions such as rough terrain, short touris season, and the necessity of preserving the natural scene.

Student assistant training program.—A program for the systemati summer employment of promising students majoring in landscap architecture, engineering, and architecture following completion o their sophomore and junior years was undertaken during the 195 summer season in the hope of providing a reservoir of technicall trained personnel for future permanent employment by the Servic This program was so successful that it is planned to continue it. O the 35 students employed the first season, several have accepted per manent employment in the lower professional grades.

THE PARK FORESTS

Forest-fire control is the concern of all large forest-land managin agencies, regardless of location or purpose. The problems of contro of forest fires within these wild lands have a marked similarity Frequently numerous or large fires not only involve the territory o more than one agency but also demand the maximum effort of sev eral at the same time. Recognizing these essential facts, the Service has worked toward a broader knowledge of our neighbor's problems and the men who carry on this work. Joint agency meetings in the East and West, geared to this purpose, have increased the efficiency of mutual aid and further improved the fine relationships at all levels of operation.

The Service's fire record for the year is of interest. Although the total number of 465 fires was exceeded only twice during the preceding 25 years, the total acreage burned (6,133) within areas administered by the Service was well below the average. The total number of lightning fires (197) was the greatest ever recorded.

The Service's good fire record was attained during a year when conditions were serious over the country as a whole. The eastern States suffered severe losses by fire during the long dry period of late summer and entire fall.

Tree disease control.—White pine blister rust continues to be the ree disease of major concern. The initial phase of the control program is nearing completion, with 73 percent of the control area now requiring only infrequent reexamination. Of unusual interest this year was the successful establishment of the Mount Whitney blister-rust-control camp at an elevation of 10,500 feet in Sequoia National Park. As a result of this project, initial control work was successfully completed on one major unit of unusual sub-Alpine white pines. All equipment and supplies needed to set up the camp were flown in and dropped by parachute. Movement of this material by pack animals would have seriously delayed the opening of the program since travel hrough the mountain passes of the Sierra Nevada is frequently impossible until snow melts in late summer.

With the successful completion of the first phase of the dwarf-mistletoe control project in the ponderosa pine forests on the South Rim, at Grand Canyon National Park, a similar project was initiated t Bryce Canyon National Park.

Forest insects.—Forest insect conditions were of major concern at hree western areas. The intensifying spruce budworm epidemic entering Yellowstone National Park along the Continental Divide reuired aerial spray control. Experimental treatment by aerial spray s recommended to reduce the extensive damage to lodgepole pine y needle miner in the high elevations at Yosemite National Park. A erious epidemic of spruce barkbeetle has developed on the Flathead National Forest and threatens adjacent Glacier National Park.

Elsewhere maintenance control has generally been effective in eeping barkbeetle and defoliator damage to a minimum. Barkeetles at Lassen Volcanic National Park and defoliating insects in outhwestern areas required aggressive control measures this year.

Wherever practical, insect-treated trees have been salvaged for usable wood products, resulting in decreased costs of control.

Grazing.—The number of livestock-grazing permits was decreased, despite increasing pressures to open new areas for such use. Pasturing use in eastern historical areas showed a slight increase, as did pack and saddle stock grazing on western areas.

Tree maintenance.—Tree-maintenance work, similar to that now accomplished in the eastern areas, is urgently needed in the developed and public-use areas of the western national parks and monuments. The condition of the oak groves in Yosemite Valley became so serious that a special project was initiated to survey the situation, rehabilitate the most serious trees, and train a local crew in elementary arboricultural work.

NATIONAL CAPITAL PARKS

Deep concern is felt over the proposal to construct a bridge across Theodore Roosevelt Island in connection with the District's highway extension plans. This wilderness island was donated to the Federal Government as a memorial to President Theodore Roosevelt. The Congress in 1932 authorized acceptance of the island, to be maintained and administered as a natural park for the recreation and enjoyment of the public. The act contains the provision "that so long as the Roosevelt Memorial Association remains in existence, no development inconsistent with this plan be executed without the association's consent."

The Roosevelt Memorial Association, the National Capital Planning Commission, the Fine Arts Commission, the National Park Service, and other organizations have consistently opposed the construction of a bridge over the island, both because it would be in contravention of the purposes of the gift of the island to the Federal Government and its acceptance by the Congress for public use and because it would seriously affect the White House. The only direct approach to the proposed bridge would be E Street, which borders the White House Grounds on the south. This street is inadequate to carry an additional traffic load. Widening the street would necessitate encroachment on the White House Grounds. The bridge also would adversely affect the central design of the Nation's Capital and would, to a great extent, destroy the planning efforts of generations of the Nation's most capable men, beginning with President Washington.

Additions to the National Capital parks system.—The 25-acre Nevius tract adjacent to Arlington National Cemetery on the Capitol-Washington Monument-Lincoln Memorial axis was the most important single addition to National Capital parks during the year; and the area is expected ultimately to become the site of a major memorial. Total expansion of the National Capital parks system amounted to 102.71 acres.

Carter Barron Amphitheater.—On January 29, 1953, the National Capital Sesquicentennial Commission officially transferred all rights, title, and interest in the Carter Barron Amphitheater and associated structures to the National Park Service. In April, a contract was entered into between the Department of the Interior and Washington Festival, Inc., for the use of the amphitheater during the summer of 1953.

FINANCE OPERATIONS

The work of streamlining and simplifying various accounting functions was continued, as was the decentralization of authority and responsibility for many fiscal matters. All allotment functions for activities except parkway, road, and trail construction have been decentralized to the Service's regional and field offices.

The increase in the Service's workload incident to the tremendous upsurge in visitor use of the areas was recognized by Congress by modest increases in the 1953 fiscal-year appropriations. Total appropriations amounted to $33,162,330. Of this amount, $18,131,920 was for operating expenses—management and protection, maintenance and rehabilitation of physical facilities, and general expenses. The remaining $15,030,410 was for construction—$8,104,700 for parkways, $4,674,740 for roads and trails, $1,911,510 for buildings, utilities, and similar construction, and $339,460 for lands and water rights.

Fee revision to produce additional revenue.—In compliance with requests by the Bureau of the Budget and the House Appropriations Committee that more revenue be derived from visitor use of the national park areas, a new schedule of fees became effective June 8. Under this schedule a new 15-day automobile permit was established for each area which already had an automobile permit fee. The 15-day permit fee is the same as the previous annual fee; new annual fees are twice the amount of the 15-day permit fee. The revised fee schedule fixes an equitable differential between the onetime visitor and the frequent visitor and will help materially to eliminate public complaints. A further study of the fee system will be made during the 1954 fiscal year.

A detailed survey of entrance checking-station staffing needs made during the year indicated that approximately $427,000 in additional revenue could be collected by the expenditure of $200,000 more for sufficient seasonal personnel to man the checking stations the full time it would be productive to do so.

Reappraisals of rents for Service-owned housing.—In accordance with mandatory requirements, a complete reappraisal was made of all Service-owned quarters and utilities furnished in connection therewith. Every effort was made to insure uniform and equitable appraisals, and all proposed rates and determinations were reviewed by a committee of field personnel prior to final approval. The new rates are to become effective on a graduated basis at the beginning of the first pay period in the 1954 fiscal year, or July 5, 1953. Under the reappraisal the average overall increase in quarters rental was set at 67 percent, and the overall increase for utilities furnished by the Government at 91 percent. The Service owns 1,238 sets of housekeeping quarters and 600 nonhousekeeping units, which represent a capital investment of approximately $20 million.

Equipment amortization program.—The program of equipment amortization was continued, and was extended during the 1953 fiscal year to cover passenger vehicles. In addition to providing flexibility in the management of equipment funds, which are no longer classed as nonrecurring items, the program also provides for greater utilization of available equipment by operating on a pool basis, with each activity or work program contributing to the amortization fund in direct proportion to its use of such equipment. Further extension of the program will be possible when the Service's basic authorities bill, now pending before the Congress, is enacted. It will also permit improved management practices and better equipment inventory control; and will simplify accounting for amortization credits.

Audits.—Instructions and procedures covering the internal audit program were revised to enable the Service to maintain more effective controls and to carry out its responsibilities as set forth in the Budget and Accounting Procedure Act of 1950.

TRUST FUND

The National Park Trust Fund, established under authority of the Congress in 1935, was increased by $4,834.19. Of this amount, $274.49 was interest on Government bonds with a face value of $18,500, and $4,559.70 was received from rentals on certain properties in Grand Teton National Park which Jackson Hole Preserve, Inc., had donated to the United States.

In 1952 the Trust Fund Board had authorized expenditures up to $15,000 for the preparation of preliminary architectural plans for the development and construction of visitor accommodations in Grand

Teton National Park. Under this authority, $13,500 was expended in the 1953 fiscal year.

It has long been felt that greater public attention should be drawn to the possibilities offered by the National Park Trust Fund for contributions from corporations and individuals as authorized by the Federal tax laws. An anonymous gift was received during the year sufficient to permit the publication of a handsome brochure which will indicate some of the needs of the Service, unlikely to be met by appropriations, and the opportunities these present for extraordinary and lasting public service. This brochure is expected to be off the press early this fall, and every effort will be made to place it in the hands of those believed likely to be interested.

PERSONNEL MANAGEMENT

The personnel workload was heavier than in 1952 because of several factors, a major one being a study of existing positions in accordance with the requirements of the Whitten amendment, and the resultant submission of 155 redescriptions. It is felt that, despite the unusual pressure of work, the benefits from the position studies fully justified the extra work involved.

Ranger examination.—A civil-service examination for the position of park ranger GS–5, the first since 1949 (and only the second since 1937), was held in April. More than 1,500 persons applied for the examination, but less than 1,000 actually took the test, and only 246 candidates passed.

An innovation in connection with this examination was the appointment by the Civil Service Commission of a Board of Civil Service Examiners with Service-wide examining responsibilities. This board not only handled most of the details in connection with the ranger examination but in the future will perform the same functions in connection with other examinations for positions peculiar to the National Park Service or for positions in which the Service has a greater interest than other Federal agencies. Included in such positions are park naturalist, park historian, and park landscape architect. The examining board, selected by the Director and approved by the Department and the Civil Service Commission, includes the Service's personnel officer as chairman, the placement officer as executive secretary, and several key members of the Director's staff who represent important occupational fields.

Superintendents' positions.—Completion of the study of the 125 park-superintendent positions throughout the National Park Service, begun last year, resulted in the upgrading of 41 of these important positions. This in turn made possible the upgrading of subordinate positions, helping to insure the retention of the required high caliber of men and women in these important posts. Further reclassifications of superintendencies are anticipated. Studies were also made of park-ranger positions throughout Region One.

Training and employee development.—The Service participated in the fourth departmental management-training program, selecting one field employee from each region for training. The participants attended a 4-week departmental orientation program, then undertook individual training assignments in this Service, in other bureaus, and in departmental staff offices. It is believed that the training these employees received during their approximately 9-month assignment in Washington will prove invaluable, both to the trainees and to the Service.

The Service conducted its 11th general administrative training course in the Region Four office in San Francisco from March 16 to 27. The 28 employees participating in the course were drilled in the principles of National Park Service administration and in Department and Service policies, organization, legislation, and operating programs.

Numerous other training courses were held by technical units, regions, and parks, in aid of greater efficiency.

Groundwork was laid for developing a new training course for field supervisory interpretive and protection personnel in each regional office, for the purpose of acquainting them with the broad concept of Service interpretation and with new and improved interpretive techniques and procedures.

"A Guide to Supervisory Development" was prepared during the year. It will provide basic materials and a framework for a Service-wide supervisory development program for both office and field employees.

Personnel changes.—Changes, especially in the field of supervision, were too numerous to list. In-service transfers and promotions are therefore omitted. Other major changes follow:

Retirements.—Benjamin L. Hadley, superintendent, Acadia National Park; James W. Rader, superintendent, Fort McHenry National Monument, and Walter Finn, superintendent, Muir Woods National Monument.

Resignations.—Ross A. Maxwell, superintendent, Big Bend National Park, and V. Aubrey Neasham, regional historian, Region Four.

Furlough.—Carl P. Russell, superintendent, Yosemite National Park, to accept a Guggenheim Fellowship.

Awards.—Distinguished Service: Thomas C. Vint, chief of design and construction, and Jean C. Harrington, regional archeologist, Region One. Conservation Service: Horace M. Albright, Mrs. Francis B. Crowninshield, Maj. Gen. U. S. Grant III, Harlean James, the late George McAneny, John D. Rockefeller, Jr., and Tom Wallace.

PUBLICATIONS

The task of handling the Service's publications program was heavier and, in certain respects, more difficult than at any time since the close of World War II. This was largely because for the past 3 years the amount available for printing publications has remained fixed at $96,500; and the problem will be greater in 1954, with the same amount of funds in prospect and heavier demands for publications. The informational publications next year may have to be spread out among at least 50 percent more visitors than was the case in 1951—the first year $96,500 was available.

Near the end of the 1952 fiscal year, when it appeared inadvisable to submit for printing any items in the Service's two new series of sales publications, the available balances were used to requisition a number of publications which in the normal course of events would have been included in the 1953 program. This year no such funds have been available for advance printing; consequently, the 1954 program will have to bear an added load. So, the Service is faced with the problem of how to supply the field areas with necessary informational literature and at the same time include some sales items in the 1954 program.

Free informational publications.—Folders were printed for the first time for Castle Clinton and George Washington Carver National Monuments and for Federal Hall Memorial National Historic Site. Free informational publications ordered came to a total of 6,686,000 pieces. The total for the year might legitimately include those ordered near the close of the 1952 fiscal year to utilize balances—705,000 in all—so that, in point of fact, what would normally have been included in the 1953 program totaled 7,391,000 pieces, costing $89,979.77. Other miscellaneous items of informational printing amounted to $1,987.85; so, 1 year's requirements for nonsales informational printing came to a total of virtually $92,000.

Sales publications.—A revised edition of "Plants of Rocky Mountain National Park" came off the press. The first of a series of natural-history handbooks, one on Olympic National Park, is being printed. Manuscripts for 2 others have been prepared and 6 more are in progress. Three new historical handbooks—Fort Raleigh, Manassas, and Yorktown—were added to the series; 2 others, Fort Pulaski and Independence, were sent to the printer, and another, Home of

Franklin D. Roosevelt, is being prepared and will be ready for printing early in the 1954 fiscal year. "Archeological Excavations in Mesa Verde National Park" was also added to the Archeological Research Series. The first item in the National Park Service Activities Series (an informal designation), entitled "Forests and Trees of the National Park System," is being produced. "Tree Preservation Bulletin No. 6, General Spraying Practices," was completely revised and is being printed.

History and natural history association publications.—The cooperating nonprofit distributing associations, set up in various areas under authority of Congress, issued a number of highly useful publications. Booklets on the scientific and historic features of various park areas were welcome additions to the field of park literature.

NOTES OF INTEREST

President Eisenhower visited Mount Rushmore National Memorial in June.

Southwestern Monument headquarters.—In November separate offices for the Southwestern National Monuments supervisory group were reestablished and moved into quarters at Globe, Ariz., in what was formerly the Gila Pueblo archeological museum.

Volcanic activity.—Mount Trident, in Katmai National Monument, Alaska, erupted in February, sending smoke an estimated 30,000 feet high. There was also a lava, or mud, flow half a mile in length. Earlier there had been minor activity on Mageik, Martin, Novarupta, and Baked Mountains. No damage was reported from the Trident eruption, the most violent since the Mount Katmai eruption of 1912.

The eruption of Kilauea Volcano in Hawaii National Park, which began late in June 1952, lasted 136 days, the third longest in its recorded history. It drew more than 500,000 visitors from all parts of the world.

Records inventory.—Progress was made toward completion of an inventory of the records of the Service, as required by the Records Management Act of 1950. The inventory was conducted with the assistance of the Records Management Division of National Archives and the Record Service of General Services Administration.

BONNEVILLE POWER ADMINISTRATION

Paul J. Raver, Administrator

FINANCIAL RESULTS OF OPERATIONS

Lack of precipitation caused streamflows throughout the Pacific Northwest to fall off rapidly in the summer and fall of 1952, hence the output of power from the Columbia River power system, administered by the Bonneville Power Administrator, decreased to such an extent that curtailment of all interruptible loads was necessary. In addition, the Defense Electric Power Administration issued an order effective November 17, 1952, limiting power consumption of certain purchasers to 90 percent of the amounts used by them during a specified base period, and requested voluntary curtailment of loads generally.

As a consequence, the gross revenue of the Columbia River power system for the fiscal year 1953 amounted to $39,175,209, a decrease of $1,004,937 or 2.50 percent from the previous year. After deducting all expenses for operation, maintenance, administration, marketing, distribution and interest, net revenue was $9,567,592, a decrease of 39.8 percent from fiscal year 1952. A large part of the decrease in net revenue results from the addition of new and higher cost transmission facilities ahead of new generation with a consequent increase in operation, maintenance, depreciation and interest expense. The remaining decrease in net revenues resulted from the drop of $1,004,937 in gross revenue and increases in expenses at Grand Coulee (which had all 18 generators in service for a full year for the first time in 1953). The cumulative total net revenue as of June 30, 1953, amounted to $93,409,993. Table I shows a condensed summary of revenues and expenses of the system.

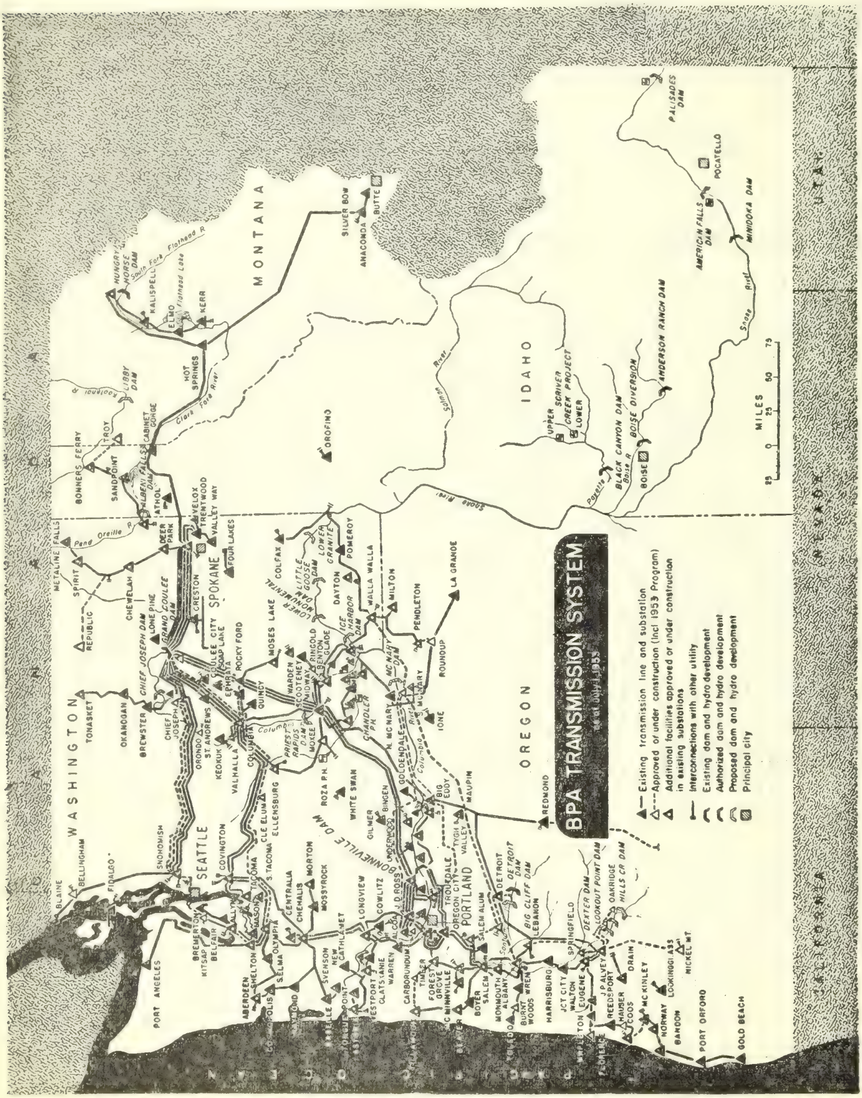

BPA TRANSMISSION SYSTEM
As of July 1, 1953
Existing transmission line and substation
Approved or under construction (incl 1953 Program)
Additional facilities approved or under construction in existing substations
Interconnections with other utility
Existing dam and hydro development
Authorized dam and hydro development
Proposed dam and hydro development
Principal city
MILES
25 0 25 50 75
WASHINGTON
OREGON
IDAHO
MONTANA
CALIFORNIA
NEVADA
UTAH
SEATTLE
SPOKANE
PORTLAND
BONNEVILLE DAM
GRAND COULEE DAM
CHIEF JOSEPH DAM
HUNGRY HORSE DAM
LIBBY DAM
ALBENI FALLS DAM
MC NARY DAM
DETROIT DAM
LOOKOUT POINT DAM
BIG CLIFF DAM
DEXTER DAM
HILLS CR DAM
ICE HARBOR DAM
LOWER MONUMENTAL DAM
LITTLE GOOSE DAM
LOWER GRANITE
PRIEST RAPIDS DAM
BLACK CANYON DAM
ANDERSON RANCH DAM
BOISE DIVERSION
AMERICAN FALLS DAM
MINIDOKA DAM
PALISADES DAM
UPPER SCRIVER CREEK PROJECT LOWER
OROFINO
BOISE
POCATELLO
BUTTE
ANACONDA
SILVER BOW
KALISPELL
KERR
ELMO
HOT SPRINGS
CABINET GORGE
TROY
BONNERS FERRY
SANDPOINT
ATHOL
METALINE FALLS
SPIRIT
REPUBLIC
TONASKET
OKANOGAN
BREWSTER
CHEWELAH
DEER PARK
LONE PINE
CRESTON
COULEE CITY
EPHRATA
ROCKY FORD
MOSES LAKE
FOUR LAKES
VALLEY WAY
TRENTWOOD
VELOX
COLFAX
POMEROY
DAYTON
WALLA WALLA
MILTON
PENDLETON
LA GRANDE
ROUNDUP
IONE
REDMOND
MAUPIN
BIG EDDY
GOLDENDALE
WHITE SWAN
ROZA P.H.
MOXEE
MIDWAY
SCOOTENEY
WARDEN
RINGOLD
BENTON
GLADE
QUINCY
COLUMBIA
VALHALLA
KEOKUK
ST. ANDREWS
ORONDO
CLE ELUM
ELLENSBURG
SNOHOMISH
COVINGTON
TACOMA
S. TACOMA
BELLINGHAM
BLAINE
FIDALGO
BREMERTON
KITSAP
BELFAIR
SHELTON
OLYMPIA
ABERDEEN
ELMA
PORT ANGELES
CENTRALIA
CHEHALIS
MORTON
MOSSYROCK
LONGVIEW
COWLITZ
CATHLAMET
SVENSON
CLATSKANIE
WARREN
CARBORUNDUM
TIMBER
FOREST GROVE
MC MINNVILLE
BOYER
SALEM
ALBANY
MONMOUTH
BURNT WOODS
HARRISBURG
JCT CITY
WALTON
EUGENE
SPRINGFIELD
OAKRIDGE
LEBANON
TROUTDALE
OREGON CITY
J.D. ROSS
ALCOA
TYGH VALLEY
GILMER
BINGEN
UNDERWOOD
J.P. ALVEY
REEDSPORT
HAUSER
COOS
DRAIN
MC KINLEY
NORWAY
BANDON
LOOKINGGLASS
NICKEL MT.
PORT ORFORD
GOLD BEACH
Columbia River
Snake River
Salmon River
Clark Fork River
Kootenai R
Pend Oreille R
South Fork Flathead R
Flathead Lake
Boise R
Payette R

TABLE I.—Columbia River power system—Condensed summary of revenues and expenses

	Fiscal year 1952	Fiscal year 1953	Total to June 30, 1953
Operating revenues	$40, 180, 146	$39, 175, 209	$304, 429, 094
Expenses of operation, maintenance, etc	9, 367, 657	10, 856, 179	82, 619, 508
Provision for depreciation	7, 147, 816	9, 410, 048	54, 135, 668
Interest expense	7, 608, 214	8, 983, 109	72, 635, 203
Miscellaneous deductions, net	165, 818	358, 281	1, 628, 722
Total deductions	24, 289, 505	29, 607, 617	211, 019, 101
Surplus net revenues from operations	15, 890, 641	9, 567, 592	93, 409, 993

Energization of the first generator unit at Hungry Horse Dam in October 1952 and the second unit 2 months later in December, coupled with storage benefits from Albeni Falls project, would ordinarily have the effect of increasing revenue had it not been for extraordinary water conditions. However, additional generation scheduled for future years, while increasing gross revenue, will produce less net revenue due to (1) the current high construction costs which increase the interest and depreciation expenses and (2) the relatively higher current cost of operation and maintenance labor, supplies, and materials. These factors will conceivably necessitate an increase in the present basic $17.50 kilowatt-year rate. Any adjustments necessary can become effective in December 1954 and each fifth year thereafter.

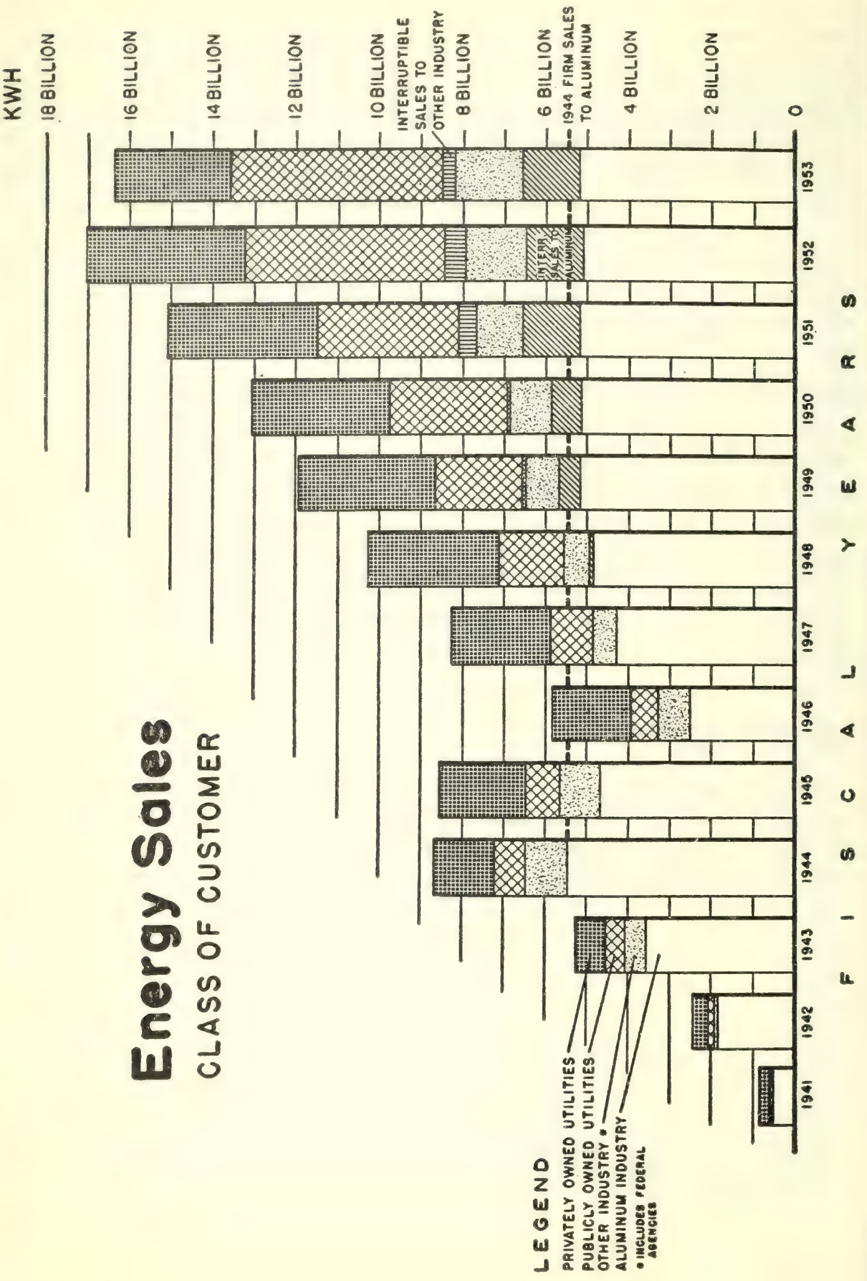
SUMMARY OF REVENUE

Sources of revenue by fiscal years to and including 1953 are summarized by customer categories in table II. The source of almost half

TABLE II.—Revenue by class of customer through fiscal year 1953

Class of customer	1948 and prior	1949	1950	1951	1952	1953	Total to June 30, 1953	1953 percentage [1]
Industry:								
Aluminum	$63, 674, 780	$11, 741, 530	$12, 133, 254	$13, 523, 276	$13, 376, 207	$13, 545, 562	$127, 994, 609	34. 78
Other [2]	16, 217, 945	2, 219, 819	2, 677, 580	3, 774, 705	4, 650, 425	4, 715, 747	34, 256, 221	12. 11
Publicly owned utilities	14, 718, 984	5, 893, 436	8, 409, 428	9, 947, 909	12, 973, 025	13, 882, 890	65, 825, 672	35. 64
Privately owned utilities	30, 874, 617	7, 756, 301	7, 587, 963	8, 525, 609	8, 526, 775	6, 239, 276	69, 510, 541	16. 02
Other operating revenue	4, 379, 840	209, 943	389, 291	417, 529	653, 714	565, 973	6, 616, 290	1. 45
Total operating revenue	129, 866, 166	27, 821, 029	31, 197, 516	36, 189, 028	40, 180, 146	38, 949, 448	304, 203, 333	100. 00

[1] Dollar revenue.
[2] Includes Federal agencies.



Energy Sales

CLASS OF CUSTOMER

the fiscal year 1953 revenue was industrial loads. The aluminum industry accounted for 34.58 percent while other industries paid 12.04 percent. Sales to publicly owned utilities accounted for 35.44 percent while private utilities accounted for 15.92 percent of the total for that year.

Despite the period of power curtailment, sales to the aluminum industry showed a slight increase due mainly to deliveries of interruptible power to the new Alcoa plant at Wenatchee, Wash., for a short time in autumn of 1952 and deliveries since February of this year. Other industrial sales also increased slightly by $65,322 or 1.4 percent.

Sales to privately owned utilities showed a decided decrease of $2,287,499 or 26.8 percent by reason of the 4-month long inability of the Federal system to meet their requirements. Sales to public power distributors increased by $909,865 or 7 percent.

REPAYMENT OF FEDERAL INVESTMENT

As summarized in table IV, the Federal investment in power projects on the Columbia River and in related transmission facilities amounted to $871,267,934 as of June 30, 1953. This investment comprised the total of all funds appropriated and requisitioned for both construction and operations, together with amounts transferred from other Federal agencies, plus accumulated interest at 2½ percent per year on the unrepaid balance. Details of the interest accumulation are shown in table III.

TABLE III.—Columbia River power system—Summary of interest on Federal investment as of June 30, 1953

Interest during construction, to be returned during repayment period as part of the Federal investment:		
Transmission system	$3, 824, 109	
Bonneville Dam project	2, 332, 118	
Columbia Basin project	9, 729, 447	
Hungry Horse project	4, 361, 688	
Subtotal		$20, 247, 362
Interest on costs at projects allocated to future river regulation, to be returned as part of repayment of future downstream projects:		
Columbia Basin Project	11, 630, 553	
Hungry Horse project	84, 978	
Subtotal		11, 715, 531
Interest charged to operations:		
Transmission system	26, 100, 501	
Bonneville Dam Project	17, 070, 745	
Columbia Basin project	28, 888, 858	
Hungry Horse project	575, 100	
Subtotal		72, 635, 204
Gross interest accumulation		104, 598, 097

TABLE IV.—Columbia River power system—Summary of Federal investment and repayment as of June 30, 1953

	Gross investment	Repayments	Net investment
Investment in current expense:			
Operation, maintenance, etc	$75,037,632	$74,864,714	[2] $172,918
Interest [1]	72,635,204	72,060,104	[2] 575,100
Total current expenses	147,672,836	146,924,818	[2] 748,018
Investment in capital assets:			
Electric plant, inventories, etc. [3]	669,496,650	145,857,094	523,639,556
Unexpended appropriations	54,098,448		54,098,448
Total capital investment	723,595,098	145,857,094	577,738,004
Total federal investment	871,267,934	292,781,912	578,486,022

[1] The Columbia River Power System does not receive appropriations for payment of interest, but imputes and includes in its accounts provisions for interest expense and returns receipts to the Treasury in repayment of such expense.

[2] Represents expenses at Hungry Horse Project which was in service in 1953 on a partially completed basis. These expenses were not covered by receipts returned to the Treasury in that year for the account of the Project, but as of June 30, 1953, the Project had an account due from Bonneville Power Administration of $781,000 for power operations. The transfer of receipts for this account in 1954 will repay these expenses and leave a remainder of $32,982 in repayment of capital investment of the Project.

[3] Includes interest during construction of $20,247,362, which will be repaid to the Treasury as part of the capital cost of electric plant, and $11,715,531 of interest charged to future downstream regulation recoverable from operations of future downstream hydroelectric plants.

Except for small amounts transferred to a continuing fund which is maintained to insure continuous operation or meet emergencies, all receipts from power sales and miscellaneous sources are returned to the United States Treasury. As of June 30, 1953, repayments have totaled $292,781,912, leaving the unpaid balance of $578,486,022. The latter amount consists of $577,738,004 in unrepaid capital investment plus $748,018 of unrepaid operation and maintenance and interest expense at Hungry Horse Dam for the fiscal year 1953. Of the total repaid, $146,924,818 represents payment of current expenses from inception to date and the remaining amount of $145,857,094 is repayment on the capital investment of $723,595,098, consisting primarily of electric-utility plant as shown in table V. The repayment is substantially in excess of scheduled requirements.

TABLE V.—Columbia River power system—Summary of plant accounts as of June 30, 1953

Project	Total	Allocation	
		Nonpower	Power
Bonneville Power Administration	$299,094,735		$299,094,735
Bonneville Dam project	86,845,427	$27,283,837	59,561,590
Columbia Basin project	468,150,738	261,256,440	206,894,298
Hungry Horse project	104,286,995	19,288,520	84,998,475
Total	958,377,895	307,828,797	650,549,098
Less combined reserve for depreciation			52,999,506
Total less reserve			597,549,592

Based on individual projects, the return of the power-capital investment has been as follows:

Project	Gross power-capital investment	Deduct unexpended appropriations	Power capital investment	Repaid as of June 30, 1953		Net power investment
				Amount	Percent	
Bonneville Power Administration	$355, 928, 323	$50, 737, 393	$305, 190, 930	$81, 964, 087	26. 86	$223, 226, 843
Bonneville Dam project	59, 923, 979	99, 193	59, 824, 786	20, 343, 163	34. 00	39, 481, 623
Columbia Basin project	220, 414, 582	813, 081	219, 601, 501	43, 100, 278	19. 63	176, 501, 223
Hungry Horse project	87, 328, 214	2, 448, 781	84, 879, 433	449, 566	0. 53	84, 429, 867
Total	723, 595, 098	54, 098, 448	669, 496, 650	145, 857, 094	21. 79	523, 639, 556

Foregoing data on repayment of the investment are based on cost accounts maintained in accordance with the Federal Power Commission uniform system of accounts. On a statutory repayment basis, the repayment percentages are the same as in the above table for the Bonneville Power Administration and Bonneville Dam, but different for the Columbia Basin project, since in the case of the latter (1) power revenues must pay operation and maintenance costs of Grand Coulee Dam and powerplant allocated to irrigation, (2) interest expense is computed at 3 percent rather than 2½ percent, and (3) other differences such as the exclusion of interest during construction in the pay-out accounts of the Columbia Basin project.

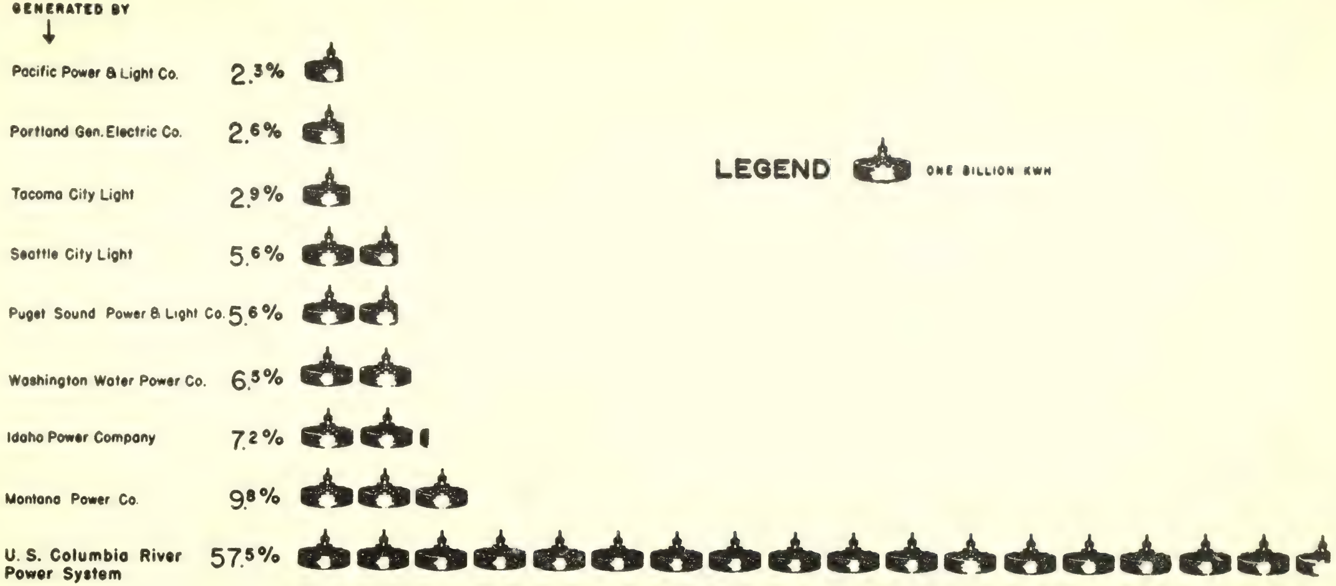
SUMMARY OF OPERATIONS

Energy Production

Energy generated at four Federal plants for the Administration totaled 17.6 billion kilowatt-hours during fiscal year 1953. Even with 2 Hungry Horse units added to the system by December 1, 1952, and 1 Detroit unit coming on for test near the end of June, energy generation was 5 percent less in 1953 than in fiscal year 1952. Below-normal precipitation during the first half of the fiscal year reduced streamflow in most of the Columbia River Basin to near minimum levels. Generation from streamflow was below the minimum year of 1936–37 during September and December. Total generation at Federal plants from July 1939 through June 1953 was 133.2 billion kilowatt-hours.

Power Generated BY THE PRINCIPAL ELECTRIC UTILITIES OF THE PACIFIC NORTHWEST

YEAR ENDED JUNE 30, 1953



TOTAL 30.6 BILLION KWH

SOURCE: WEEKLY OPERATING REPORTS OF N. W. POWER POOL

THE ABOVE UTILITIES ARE MEMBERS OF THE NORTHWEST POWER POOL. UTAH POWER & LIGHT CO. AND BRITISH COLUMBIA ELECTRIC CO. ARE ALSO POOL MEMBERS BUT ARE NOT INCLUDED IN THIS CHART BECAUSE THEIR MAJOR SERVICE AREAS LIE OUTSIDE THE PACIFIC NORTHWEST REGION.

New System Peak

A new system peak was reached for the hour 12–1 p. m. on August 13, 1952, before the generators at Hungry Horse were in operation. Coincident demand on Bonneville and Grand Coulee plants was 2,867,000 kilowatts, an increase of 3 percent over the previous fiscal year's maximum demand of 2,784,000 kilowatts occurring during December 1951.

Since the fall of 1946, maximum system demands have continuously exceeded the nameplate rating of installed generators. Energy produced at Federal plants for the Administration is shown by years in table VI, with peak demand and energy data in the accompanying chart. Prepared on a quarterly basis, the chart shows the general trends of the Bonneville Power Administration system-load growth and development.

TABLE VI.—Generation at Bonneville, Detroit, Grand Coulee, and Hungry Horse plants for Bonneville Power Administration, fiscal years 1939–53

[Thousands of kilowatt-hours]

Fiscal years ending June 30	Bonneville generation	Detroit generation	Grand Coulee generation	Hungry Horse generation	Total generation for BPA
1939	34, 874				34, 874
1940	208, 426				208, 426
1941	894, 177		7, 455		901, 632
1942	1, 807, 309		741, 844		2, 549, 153
1943	2. 801. 480		2, 816, 956		5, 618, 436
1944	3 488, 874		5, 750, 949		9, 239, 823
1945	3. 391. 127		5, 660, 446		9, 051, 573
1946	2, 674. 834		3, 561, 329		6, 236, 163
1947	3, 695, 255		5, 058, 482		8, 753, 737
1948	3, 991. 860		[1] 6, 894. 047		10, 885, 907
1949	3, 868, 558		[1] 9, 057, 230		12, 925, 788
1950	3, 689, 309		[1] 10, 451, 524		14, 140, 833
1951	3, 793, 276		[1] 12, 679. 108		16, 472, 384
1952	4 462, 935		[1] 14, 092, 466		18, 555. 401
1953	4, 227, 463	[2] 2, 149	[1] 13, 277, 143	[3] 126. 477	17, 633, 232
Total	43, 029. 757	2, 149	90, 048, 979	126, 477	133, 207, 362

[1] Includes energy transferred for Bureau of Reclamation.

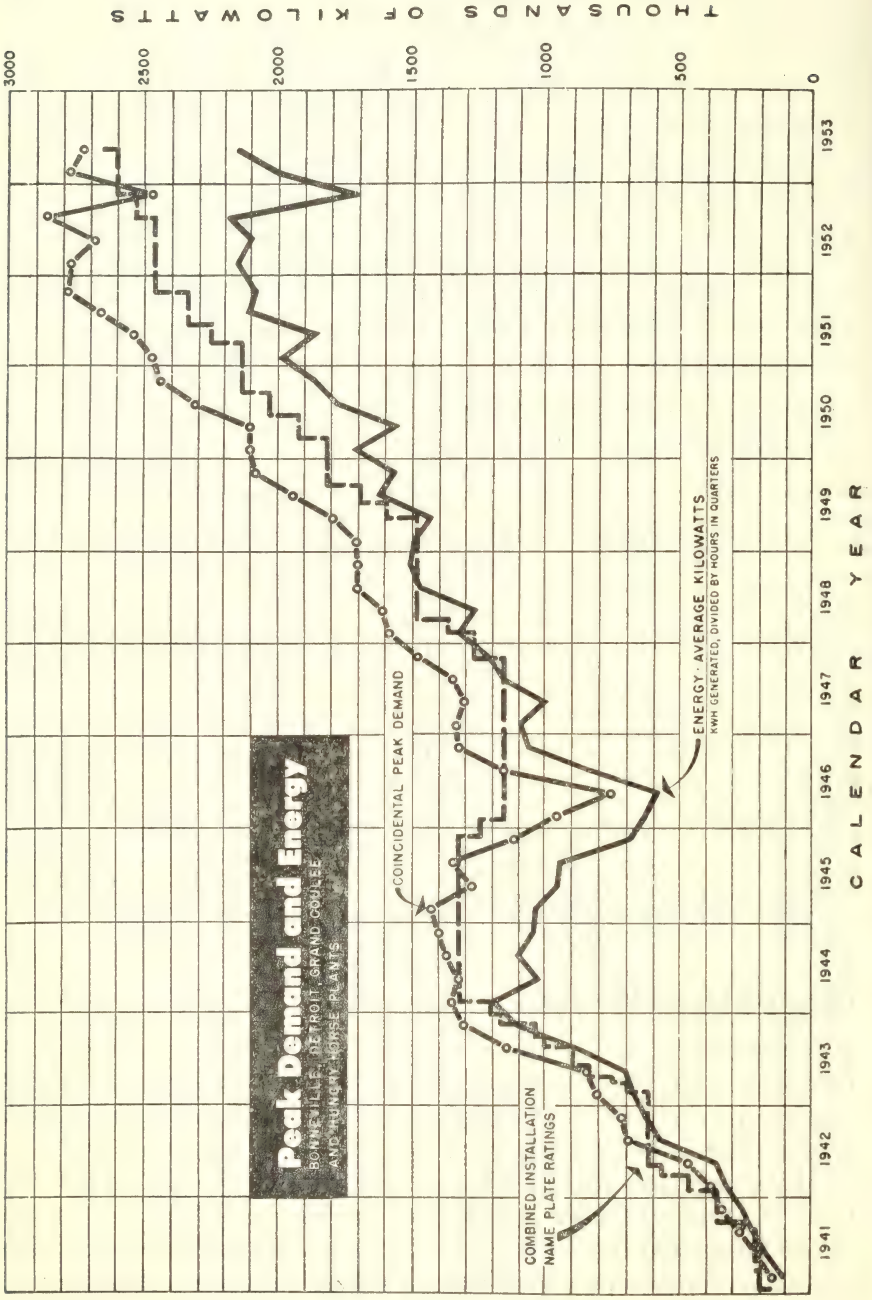
[2] Energy from testing operations; generator not in commercial operation during 1953 fiscal year.

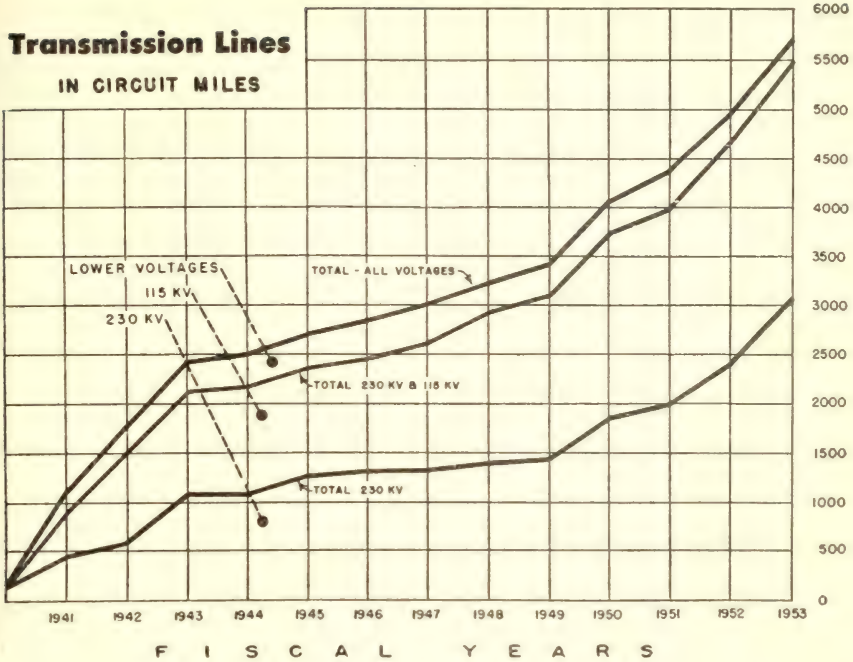
[3] Includes 1,078,640 kilowatt-hours delivered to the Administration during testing operations.

Energy Receipts and Deliveries

Bonneville Power Administration's transmission grid forms the backbone of the interconnected transmission system of public and private utilities in the Pacific Northwest. As a result, electric-energy receipts and deliveries on Bonneville's transmission system cover many complex transactions in addition to receipts from Bonneville and Grand Coulee generation, and deliveries by sales.

The integrated transmission grid makes possible the fullest utilization of power facilities in the area through diversity in peaking and water capabilities and diversity of system-load conditions. Substantial quantities of energy are received and delivered as transfers from other utilities.


Peak Demand and Energy
BONNEVILLE, DETROIT, GRAND COULEE AND HUNGRY HORSE PLANTS
THOUSANDS OF KILOWATTS
3000
2500
2000
1500
1000
500
0
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
CALENDAR YEAR
COINCIDENTAL PEAK DEMAND
ENERGY · AVERAGE KILOWATTS
KWH GENERATED, DIVIDED BY HOURS IN QUARTERS
COMBINED INSTALLATION NAME PLATE RATINGS



Transactions also involve storage by the Administration in non-Federal reservoirs as well as storage by non-Federal utilities in the Grand Coulee reservoir. Disposition of energy includes deliveries from storage in Grand Coulee or to storage in other reservoirs, energy transfers for the Bureau of Reclamation from Grand Coulee, energy used by the Administration and energy losses in transmission and transformation.

Table VII, electric-energy account, summarizes energy receipts and deliveries for fiscal year 1953.

TABLE VII.—Electric energy account, fiscal year ended June 30, 1953

Energy received (energy generated for Bonneville Power Administration):		
Bonneville	thousands of kilowatt-hours	4, 227, 463
Detroit	do	[1] 2, 149
Grand Coulee	do	[2] 13, 277, 143
Hungry Horse	do	[3] 126, 477
Total	do	17, 633, 232
Power purchased and interchanged in	do	1, 953, 450
Total received	do	19, 586, 682

---

[1] Energy from testing operations; generator not in commercial operation during 1953 fiscal year.

[2] Includes 35,899,156 kilowatt-hours transferred for the Bureau of Reclamation.

[3] Includes 1,078,640 kilowatt-hours delivered to the Administration during testing operations.

TABLE VII—Continued

Energy delivered:		
Sales	thousands of kilowatt-hours	16, 381, 690
Power interchanged out	do	1, 860, 427
Used by Administration	do	21, 977
Total delivered	do	18, 264, 094
Energy losses in transmission and transformation	do	1, 322, 588
Losses of total energy received	percent	6. 8
Maximum demand on generating plants Aug. 13, 1952, 12–1 p. m. Pacific standard time	kilowatts	2, 867, 000
Load factor, total generated for Bonneville Power Administration	percent	70. 2

Water Conditions Affect Sales

Energy sales to customers of the Bonneville Power Administration totaled 16.4 billion kilowatt-hours during fiscal year 1953, a decrease of 4 percent from the previous year.

With near-minimum streamflows, generation was curtailed and interruptible deliveries to industrial customers was discontinued from early in September 1952 until February 1, 1953. Power-curtailment orders by the Defense Electric Power Administration cut down service to the Bonneville Power Administration industrial customers and made possible larger deliveries from the Federal system to other public and private utilities in the area.

With increased service to the Alcoa Wenatchee plant on an interruptible basis, deliveries to aluminum plants increased 1.2 percent even with the 10-percent curtailment in firm deliveries ordered by the Defense Electric Power Administration from November 17 through January 12, 1953. Deliveries to industries other than aluminum decreased 11.1 percent while Federal agencies increased 12.8 percent, publicly owned utilities increased 6.2 percent, and privately owned utilities had a decrease of 26.6 percent.

Composite Average Rate 2.40 Mills

The Administration has delivered 123,838,729,000 kilowatt-hours of energy at a composite average rate of 2.40 mills per kilowatt-hour during the 15 years of operation ending June 30, 1953. Sales to publicly owned utilities for this period were 23.6 billion kilowatt-hours at an average rate of 2.78 mills. Privately owned utilities received 29.4 billion kilowatt-hours at an average rate of 2.35 mills, and industries 70.8 billion kilowatt-hours at an average rate of 2.29 mills.

Power sales to aluminum plants were 58.8 billion kilowatt-hours at an average rate of 2.18 mills. Sales to industries other than aluminum, including sales to Federal agencies, were 12 billion kilowatt-hours at an average rate of 2.83 mills.

Since 1942 the proportion of energy sales delivered to aluminum plants with high load-factor usage of electric energy has been decreasing, resulting in a tendency toward a higher average price per kilowatt-hour. Increasing load factors developed by other customers have counterbalanced this tendency in recent years. For the fiscal year 1953, curtailment of energy deliveries because of low streamflows again increased the average rate of 2.35 mills per kilowatt-hour as compared to 2.31 and 2.37 for the two previous fiscal years. The same set of rate schedules, based on $17.50 a kilowatt-year, is available to all customers, but the average rate varies according to the customer's system-load conditions and the rate schedules best adapted to those load conditions.

Electric-energy sales by class of customer for each of the 14 years' operation are shown in table VIII. Detail of energy deliveries to these four classes of customers is shown in accompanying chart. The relative size and growth of energy sales to aluminum plants, other industries, privately owned utilities, and publicly owned utilities is shown in the chart.

TABLE VIII.—Electric energy sales by class of customer—fiscal years 1939–53

[Thousands of kilowatt-hours]

Fiscal years ending June 30	Industry		Publicly owned utilities	Privately owned utilities	Total
	Aluminum	Other industries [1]			
1941 and prior	522, 982	4, 829	35, 242	536, 555	1, 099, 608
1942	1, 845, 249	79, 155	142, 491	357, 704	2, 424, 599
1943	3, 588, 848	507, 196	435, 289	739, 076	5, 270, 409
1944	5, 453, 893	1, 022, 477	727, 642	1, 467, 304	8, 671, 316
1945	4, 667, 381	964, 724	823, 822	2, 057, 203	8, 513, 130
1946	2, 492, 985	799, 378	635, 531	1, 902, 990	5, 830, 884
1947	4, 212, 413	626, 688	1, 044, 784	2, 377, 887	8, 261, 772
1948	4, 902, 465	646, 913	1, 560, 754	3, 180, 993	10, 291, 125
1949	5, 665, 746	881, 454	2, 079, 289	3, 343, 091	11, 969, 580
1950	5, 863, 465	1, 023, 830	2, 840, 033	3, 311, 972	13, 039, 300
1951	6, 544, 702	1, 537, 580	3, 413, 829	3, 578, 212	15, 074, 323
1952	6, 471, 694	1, 943, 241	4, 803, 232	3, 792, 826	17, 010, 993
1953	6, 546, 923	1, 947, 523	5, 103, 011	2, 784, 233	16, 381, 690
Total to June 30, 1953	58, 778, 746	11, 984, 988	23, 644, 949	29, 430, 046	123, 838, 729

[1] Includes Federal agencies.

Rate Schedules Summarized

A summary of energy sales for the fiscal year 1953 classified by rate schedules is shown in table IX. Just less than three-fourths of the energy sales for the year were made under the C–4 wholesale rate schedule at an average rate of 2.09 mills per kilowatt-hour. This is the kilowatt-year rate for firm power delivered anywhere from the transmission system and is also used with special measured demand provisions for sales of interruptible power. Sales are generally made under this rate to industries operating at high load factor and to utilities having substantial generating facilities. Other sales were made principally under the E schedule to utilities purchasing all or substantially all of their power requirements from the Administration. Sales under the F schedule were made to the utilities and industries requiring power at low load factor use and under the H schedule for dump, exchange, or experimental purposes.

TABLE IX.—Electric energy sales by rate schedules—fiscal year ending June 30, 1953

Rate schedule	Energy (thousands of kilowatt-hours)	Revenue	Mills per kilowatt-hour
C-3, C-4:			
Industries	8,069,222	$16,880,432	2.09
Utilities	3,881,699	8,094,174	2.09
Subtotal	11,950,921	24,974,606	2.09
F-2, F-3, F-4:			
Industries	182,321	666,472	3.66
Utilities	64,101	395,864	6.18
Subtotal	246,422	1,062,336	4.31
A-4: Utilities	23,552	74,438	3.16
E-3, E-4: Utilities	2,792,770	8,884,047	3.18
Experimental, H-2, H-3 and exchange: Industries and utilities	1,368,025	3,420,062	2.50
Total sales	16,381,690	38,415,489	2.35
Reconciliation with accounting records		−32,014	
Other electric revenues		565,973	
Total operating revenues		38,949,448	

Customers Served

The Administration was serving 115 customers at the end of the fiscal year 1953. There were 78 publicly owned distributors of power, 16 industrial customers, 13 Federal agencies, and 8 privately owned utilities. Three customers were added during the year—Flathead Electric Cooperative, Midstate Electric Cooperative, and the United States Army Corps of Engineers at Midway.

Installation of generators at Hungry Horse project was completed in fiscal year 1953. Units 1 and 2 were in operation by December 1, 1952, and the remaining 2 units were installed and ready for testing by the end of the fiscal year. The first unit of the Detroit project began operations June 26, 1953. Capability of the Federal system was increased during the 1952–53 power season by the availability of new storage in the amount of 548,000 acre-feet at the Hungry Horse Reservoir and 1,155,000 acre-feet at the Albeni Falls Reservoir.

Federal projects existing, under construction, and authorized for construction by the Corps of Engineers and the Bureau of Reclamation are shown in table X. Existing projects account for 8,671,900

TABLE X.—General specifications—Existing and authorized projects. Installations and capabilities correspond to a coordinated system of operation

	Location	Stream	Plant installations		Nominal prime power average (kilowatts)[2]	Pool elevation (feet)	Usable storage (acre-feet)	Average head (feet)	Initial date in service [3]	Principal purposes [4]
			Number units	Total capacity (kilowatts)[1]						
Existing projects:										
Minidoka	Idaho	Snake	7	13, 400	5, 000	4, 245. 0	95, 200	48	May 1909	P, I.
Boise Diversion	do	Boise	3	1, 500	2, 000	2, 800. 0		31	1912	P, I.
Black Canyon	do	Payette	2	8, 000	8, 000	2, 497. 0	14, 500	88	1925	P, I.
Bonneville	Washington-Oregon	Columbia	10	518, 400	458, 000	72. 0		59	January 1938	P, N.
Grand Coulee	Washington	do	18	1, 944, 000	1, 631, 000	1, 288. 0	5, 118, 000	326	March 1941	P, I, FC.
Anderson Ranch	Idaho	South Fork of Boise	2	27, 000	21, 000	4, 196. 0	464, 200	260	December 1950	P, I, FC.
Hungry Horse	Montana	South Fork of Flathead	4	285, 000	187, 000	3, 560. 0	2, 980, 000	364	October 1952	P, I, FC.
Projects under construction:										
Detroit	Oregon	North Santiam	2	100, 000	29, 000	1, 569. 0	351, 000	299	June 1953	P, I, N, FC.
McNary	Washington-Oregon	Columbia	14	980, 000	583, 000	340. 0		83	December 1953	P, I, N.
Big Cliff	Oregon	North Santiam	1	18, 000	10, 000	1, 206. 0		91	April 1954	P.
Albeni Falls	Idaho	Pend Oreille	3	42, 600	29, 000	2, 062. 5	1, 155, 000	24	August 1954	P, FC.
Lookout Point	Oregon	Middle Fork of Willamette	3	114, 000	36, 000	929. 0	368, 000	228	October 1954	P, I, N, FC.
Dexter	do	do	1	15, 000	12, 000	695. 0		53	April 1955	P.
Chief Joseph	Washington	Columbia	18	1, 152, 000	815, 000	937. 5		169	September 1955	P, I.
Chandler	do	Yakima	2	12, 000	11, 000	620. 0		118	do	P, I.
Palisades	Idaho	Snake	4	114, 000	41, 000	5, 620. 0	1, 200, 000	144	December 1956	P, I, FC.
The Dalles	Washington-Oregon	Columbia	14	1, 092, 000	651, 000	160. 0		87	November 1957	P, N.
Authorized projects:										
Roza	Washington	Yakima	2	10, 000	6, 000	1, 220. 6		140	October 1956	P, I.
American Falls	Idaho	Snake	3	30, 000		4, 354. 5	1, 700, 000	80	October 1957	P, I.
Ice Harbor	Washington	do	3	195, 000	137, 000	440. 0		97	December 1957	P, I, N.
Libby	Montana	Kootenai	6	600, 000	264, 000	2, 459. 0	5, 175, 000	267	September 1959	P, FC.
Hills Creek	Oregon	Middle Fork of Williamette	1	20, 000	14, 000	1, 510. 0	221, 000	204	December 1959	P, I, N, FC.
Lower Monumental	Washington	Snake	3	180, 000	130, 000	533. 0		92	December 1960	P, I, N.
Little Goose	do	do	3	195, 000	139, 000	633. 0		99	December 1961	P, N.
Lower Granite	do	do	3	165, 000	114, 000	715. 0		80	December 1962	P, N.
Priest Rapids	do	Columbia	23	1, 219, 000	735, 000	550. 0	(5)	146	do	P, N, FC.
John Day	Washington-Oregon	do	13	1, 105, 000	675, 000	255. 0	(5)	94	December 1964	P, I, N, FC.
Cougar [6]	Oregon	South Fork of McKenzie	1	25, 000	14, 000	1, 683. 0	182, 000	418		P, I, N, FC.
Green Peter [6]	do	M. Santiam	2	81. 000	22. 000	994. 0	322, 000	315		P, I, N, FC.
White Bridge [7]	do	do	1	15, 000	9, 000	670. 0		93		P.
Less irrigation pumping requirements.					[8]—35, 000					
Total (30 projects)				10, 276, 900	6, 753, 000		19, 345, 900			

---

[1] Nameplate rating.

[2] Average capability during an 8-month storage drawdown period (September 1936 through April 1937).

[3] Generator installation and storage development dates correspond to schedule V, dated Dec. 1, 1952.

[4] P=power; I=irrigation; N=navigation; FC=flood control.

[5] Project designs provide for flood-control storage of 2,100,000 acre-feet at Priest Rapids and 2,000,000 acre-feet at John Day.

[6] Power facilities are not authorized.

[7] White Bridge is not authorized but is required for reregulating purposes with installation of generating units at Green Peter.

[8] Pumping requirements of 28,000 average kilowatts for 450,000 acres of the Columbia Basin project and of 7,000 average kilowatts in the upper Snake Basin, including 367,000 acres of new irrigated land.

acre-feet of usable storage and 2,312,000 average kilowatts of normal prime power. Projects under construction will provide 3,074,000 acre-feet of usable storage with 2,217,000 average kilowatts of prime power. Projects authorized by the Congress, but for which no funds have been appropriated, would add 7,600,000 acre-feet of usable storage and 2,259,000 average kilowatts of normal prime power. Complete development of these multipurpose projects will provide a total of 19.3 million acre-feet of usable storage for power use and 6.8 million kilowatts of prime power.

Non-Federal Additions

Additions were made to the generating facilities of several non-Federal utilities during the fiscal year. Two units with total rated capacity of 180,000 kilowatts were installed at the Ross plant of the city of Seattle, and 135,000 kilowatts of new capacity were added at the Rock Island plant by the Chelan County PUD. The Washington Water Power Co. installed the first 3 units with total rated capacity of 150,000 kilowatts at Cabinet Gorge plant, and the Portland General Electric Co. reconstructed its Sullivan plant with an increase in rated capacity of 10,500 kilowatts. Future additions presently scheduled by the non-Federal utilities are shown in table XI.

TABLE XI.—Non-Federal utilities—Generator installation schedule, July 28, 1953

Utility and plant	Unit No.	Nameplate rating (thousands of kilowatts)	Date in service
Pacific Power & Light Co.: Yale (190,000 acre-feet of usable storage).	1 2	54 54	August 1953. October 1953.
Total		108	
Washington Water Power Co.: Cabinet Gorge	4	50	August 1953.
Portland General Electric Co.:			
Oak Grove (Frog Lake forebay)		(1)	September 1953.
Timothy Meadows (60,000 acre-feet of storage)		(2)	March 1955.
City of Seattle: Ross (1,018,000 acre-feet of usable storage)	3	90	December 1953.
Pend Oreille PUD: Box Canyon	1 2 3 4	15 15 15 15	June 1954. August 1954. October 1954. November 1954.
Total		60	
City of Tacoma: Steam plant No. 2	2 [3] 3 [3] 4	20 4 4	August 1954. December 1954. March 1955.
Total		28	

[1] Will add 18,000 kilowatts of peaking capacity.
[2] Will add 10,000 kilowatts of prime power at downstream plants.
[3] Gas turbines.

TABLE XI.—Non-Federal utilities—Generator installation schedule, July 28, 1953—Continued

Utility and plant	Unit No.	Nameplate rating (thousands of kilwatts)	Date of Service
Montana Power Co.:			
Kerr (1,220,000 acre-feet of usable storage)	3	56	September 1954.
Thompson Falls	7–13	35	September 1956.
Total		91	
California Oregon Power Co.:			
Lemolo No. 1		29	December 1954.
Lemolo No. 2		33	December 1955.
McCloud No. 1		50	Do.
Big Bend No. 2		50	December 1956.
Iron Gate		9	December 1957.
Salt Caves		70	Do.
McCloud No. 2		50	December 1958.
Keno		48	December 1960.
Big Bend Nos. 1 and 3		50	December 1962.
McCloud No. 3		50	December 1963.
Total		439	
City of Centralia: Yelm	3	5	July 1955.

Northwest Power Pool

Generation during fiscal year 1953 by the principal electric utility systems of the Pacific Northwest is shown in table XII. All of the utilities are members of the Northwest Power Pool. The Utah Power & Light Co. and British Columbia Electric Co. are also members of the pool but are not included since their major service areas are outside the Pacific Northwest region.

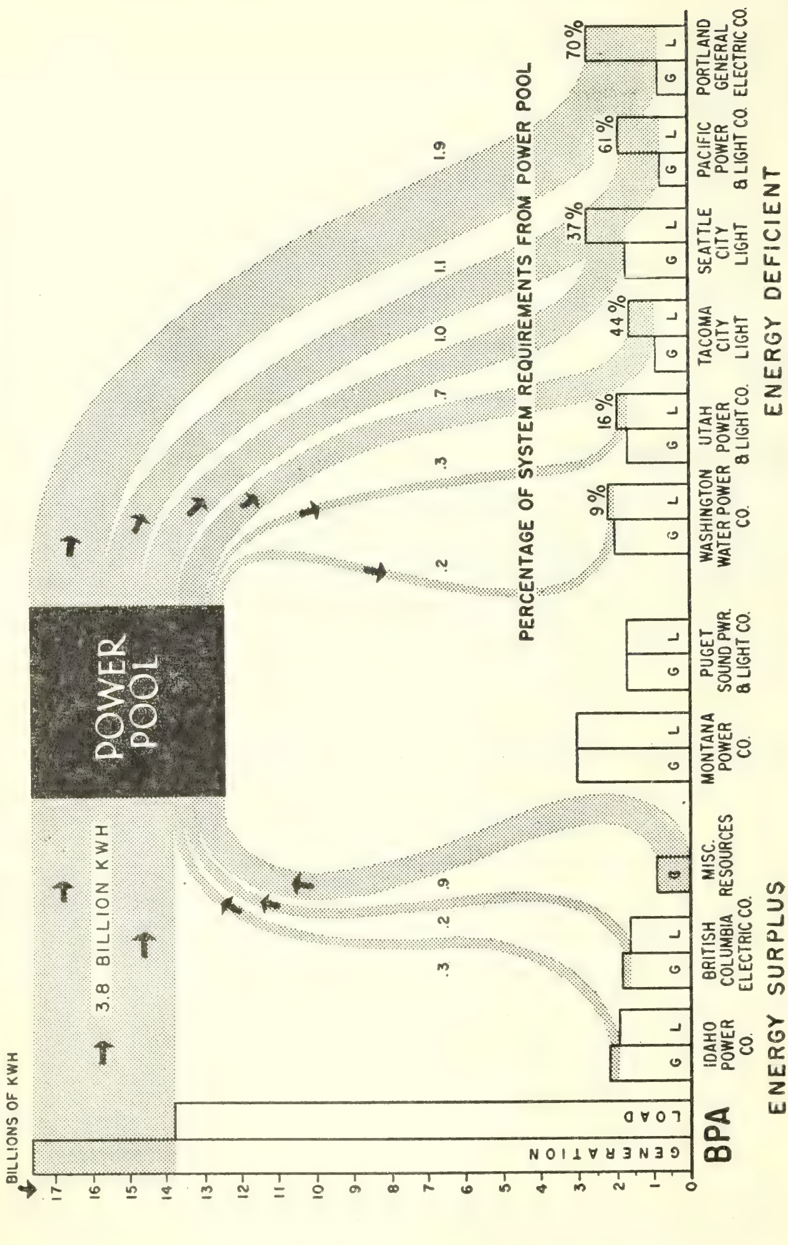
TABLE XII.—Generation by the principal electric utility systems of the Pacific Northwest—fiscal year 195

Utilities	Kilowatt-hours	Percent of total generation
Publicly owned:	*Billions*	*Percent*
Bonneville Power Administration	17.6	57.5
Seattle City Light	1.7	5.6
Tacoma City Light	.9	2.9
Total publicly owned	20.2	66.0
Privately owned:		
Puget Sound Power & Light Co	1.7	5.6
Washington Water Power Co	2.0	6.5
Pacific Power & Light Co	.7	2.3
Portland General Electric Co	.8	2.6
Montana Power Co	3.0	9.8
Idaho Power Co	2.2	7.2
Total privately owned	10.4	34.0
Total generation [1]	30.6	100.0

[1] The above utilities are members of the Northwest Power Pool. Utah Power & Light Co. and British Columbia Electric Co. are also members of the pool, but are not included above because their major service areas lie outside the Pacific Northwest region.

Northwest Power Pool NET OPERATIONS YEAR ENDING JUNE 30, 1953

BPA SUPPLIED 73% OF NET ENERGY REQUIREMENTS OF POWER POOL UTILITIES



The Administration supplied 57.5 percent of the total energy generated by the major utilities serving the region. In addition to the power requirements of industries and nonpool member utilities served by the Administration, a maximum hourly delivery of nearly 900,000 kilowatts and approximately 3,800,000,000 kilowatt-hours of energy was provided for use by other pool member utilities to meet their requirements.

Transmission Systems Additions

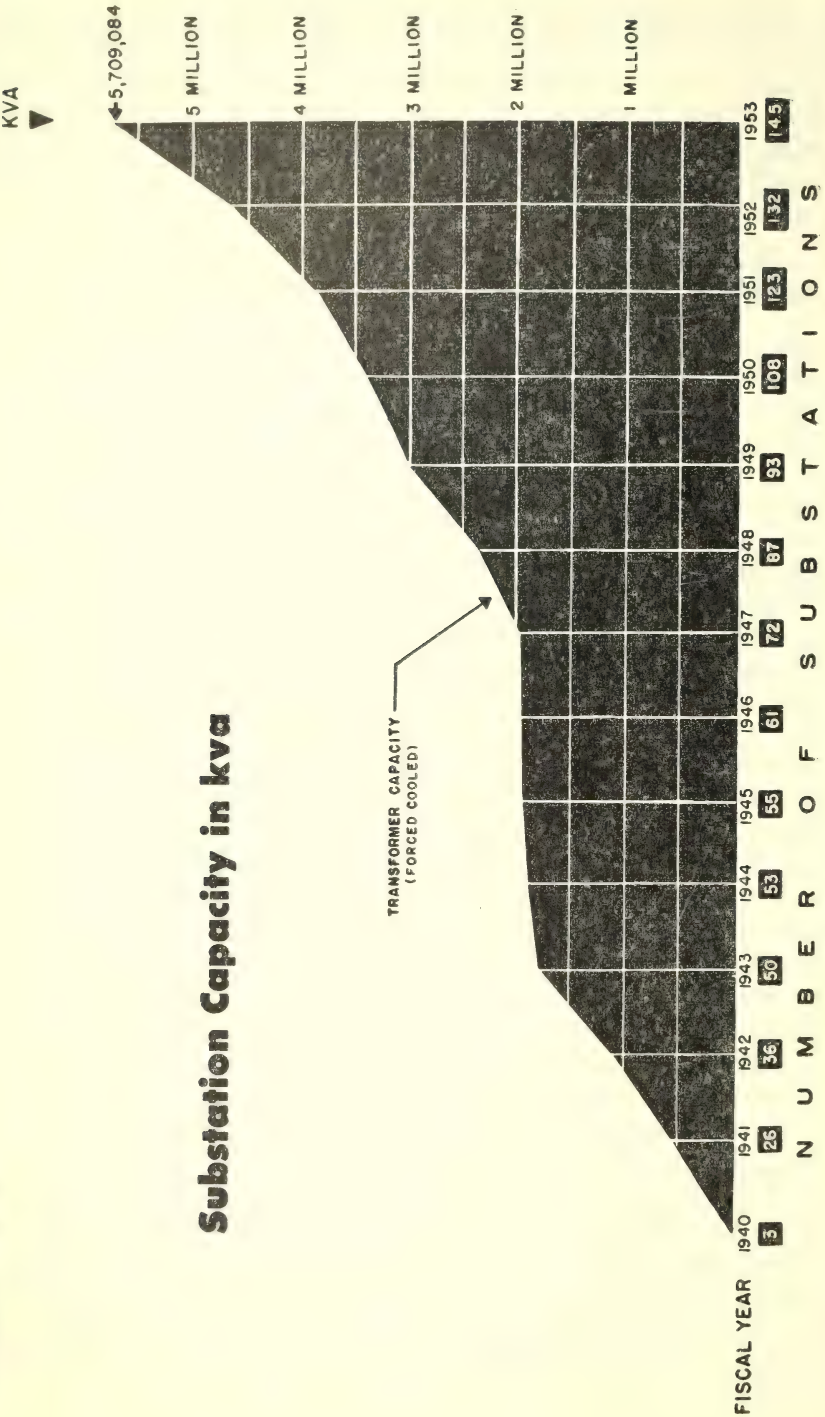
Coinciding with the initial power production from the Hungry Horse project, the Administration energized during fiscal year 1953 a 241-mile, 230,000 volt transmission line from Spokane to Hungry Horse Dam to integrate the new generation into the BPA system. A 230,000 volt 147-mile transmission line was placed in service between Hot Springs and Anaconda, Mont., with a 150,000 kilovolt-ampere substation at Anaconda, providing a high voltage transmission tie between the BPA main grid and Western Montana.

Completion of a 51-mile 115,000 volt transmission line from Bandon extended the BPA transmission system to Port Orford and Gold Beach on the Oregon coast. Increased transmission capacity to the Spokane area was provided with the energization of the 230,000 volt Grand Coulee-Spokane line No. 5.

During this fiscal year 11 new customer service substations were energized, ranging in capacity from 6,000 to 20,000 kilovolt-amperes. Other major additions during the fiscal year included energization of 250,000 kilovolt-ampere transformers at the St. Johns and J. P. Alvey substations and the energization of the St. Andrews series capacitor station on Grand Coulee-Columbia line No. 3.

A total of 753 circuit miles of transmission line and 13 substations were added to the system during fiscal year 1953, giving the Administration a total of 5,707 circuit miles of transmission lines and 145 substations. This includes 3,060 circuit miles of 230,000 volt line, 2,419 circuit miles of 115,000 volt line, and 228 miles of lower voltage line.

Substation transformer capacity was increased by 1,192,400 kilovolt-amperes, bringing the total capacity to 4,300,250 kilovolt-amperes under self-cooled conditions and a maximum of 5,709,084 kilovolt-amperes with forced-cooling. Three new 50,000 kilovolt-amperes synchronous condensers were energized, bringing the total system capacity of this type of equipment to 557,500 kilovolt-amperes. Static capacitors with a capacity of 116,965 reactive kilovolt-amperes were installed, bringing the total on the system to 859,515 reactive kilovolt-amperes.



Substation Capacity in kva

With McNary Dam scheduled to start producing power in November 1953, major construction was underway during the fiscal year to provide the transmission facilities required to bring McNary generation into the Bonneville system. To provide additional transmission capacity to the rapidly growing Puget Sound area, construction continued on a 300,000 volt transmission line from Columbia to Olympia. This line will be connected to an existing circuit from Grand Coulee to Columbia, providing a through circuit from Grand Coulee to Olympia. The 230,000 volt circuit is scheduled to be placed in service December 1953 with plans to raise the voltage to 300,000 volts in the fall of 1954.

SOUTHWESTERN POWER ADMINISTRATION

Douglas G. Wright, Administrator

For the fiscal year 1953 Southwestern Power Administration received $5,600,000 in appropriations for carrying on its overall program. The sum of $1,450,000 was appropriated for the operation and maintenance program; and $4,150,000 was appropriated for the construction program, $1,130,000 of which was for the liquidation of previous contract authorizations. Expenditures not to exceed $1 million also were authorized from the continuing fund for the purchase of electric power and energy and rentals for the use of transmission facilities.

POWER RESOURCES

Installed generating capacity more than doubled during fiscal year 1953, as shown in the following table:

Existing power installations

Project	River basin	Kilowatts of installed capacity	
		Beginning of year	End of year
Denison	Red	70,000	70,000
Norfork	White	70,000	70,000
Narrows	Ouachita (Red)	17,000	17,000
Bull Shoals	White		160,000
Fort Gibson	Grand (Neosho)		33,750
Whitney	Brazos		30,000
Total		157,000	380,750

This capacity of 380,750 kilowatts will be increased by 120,250 kilowatts (as shown in the following table) to 501,000 kilowatts:

Additional power installations (under construction)

Project	Basin	Scheduled completion date	Kilowatts of installed capacity
Fort Gibson (unit No. 4)	Grand (Neosho)	September 1953	11, 250
Tenkiller Ferry	Illinois	November 1953	34, 000
Blakely Mountain	Ouachita (Red)	July 1954	75, 000
Total			120, 250

ENERGY PRODUCTION

With the exception of a few small areas, adverse water conditions prevailed throughout the southwest region during the entire fiscal year. The current low-flow period could become the lowest of record at several of the projects should streamflow continue below average for a few more months.

At the Denison project, streamflow for the fiscal year was only 20 percent of average. Cumulative streamflow for the past 23 months was about 30 percent of normal and is the third lowest period during the past 47 years. Streamflows at the Bull Shoals, Norfork, Fort Gibson, and Whitney projects were 58 percent, 75 percent, 24 percent, and 20 percent of average, respectively. Only Narrows was above average by 20 percent. The power pool at Bull Shoals Reservoir filled for the first time during this year. Fort Gibson Reservoir, with no power storage filled its dead-storage pool for the first time. Whitney Reservoir is still below the bottom of power pool. Only incidental power was generated at this project from the relatively small amounts of water released for irrigation use downstream.

Net generation from the six reservoir projects was as follows:

Project:	*Kilowatt-hours*
Bull Shoals	270, 242, 000
Denison	92, 408, 000
Fort Gibson	32, 104, 100
Narrows	47, 418, 900
Norfork	126, 796, 500
Whitney	367, 000
Total net generation	569, 336, 500

ENERGY DELIVERIES

The Administration delivered power and energy to preferred customers directly over its lines and through the facilities of the Texas Power & Light Co., the Southwestern Gas & Electric Co., the Public Service Co. of Oklahoma, the Oklahoma Gas & Electric Co., Central Electric Power Cooperative, and Western Farmers Electric Cooperative.

Contracts with 18 rural electric cooperatives were amended to increase contract demands by a total of 5535 kilowatts, and 11 contracts with municipalities were amended to increase contract demands by a total of 1,040 kilowatts. Ten new customers started receiving electric service during this year. These include 4 municipalities and 1 military installation in Oklahoma, with a total contract demand of 1,475 kilowatts; 2 federated cooperatives with a total contract demand of 51,900 kilowatts; 2 municipalities in Missouri with a total contract demand of 5,250 kilowatts; and 1 cooperative in Texas with a contract demand of 275 kilowatts.

At the end of fiscal year 1953, the sum of the contract demands of all preferred customers served by the Administration amounted to 111,950 kilowatts, comprised of the following:

1. Distribution cooperatives, 42,150 kilowatts;
2. Federated cooperatives, 51,900 kilowatts;
3. Military installations, 4,300 kilowatts;
4. Municipalities, 13,600 kilowatts.

During the fiscal year the United States engineers declared available for service 4 generating units at Bull Shoals Dam in Arkansas, 3 units at Fort Gibson Dam in Oklahoma, and 2 units at Whitney Dam in Texas.

Projects from which this Administration marketed power during the fiscal year 1953 produced a net generation of 569,336,500 kilowatt-hours, of which 41.6 percent, or 236,893,183 kilowatt-hours was sold to preferred customers.

Gross revenue from sales by this Administration during the year amounted to $2,829,553.74; net revenue, after payment for purchase of power, interchange, and service charges, totaled $2,678,218.31. By the end of the fiscal year, wholesale power and energy generated by the hydroelectric facilities under the marketing jurisdiction of the Administration were being sold to 19 distribution cooperatives, 17 municipalities, 5 private utilities, 2 United States military installations, and 3 federated cooperatives.

Net revenue from sales of power and energy delivered through the year to preferred customers totaled $1,275,910.61; sales to private utility companies totaled $1,553,643.13.

CONTRACT NEGOTIATIONS

Negotiations between the Southwestern Power Administration and 12 private utility companies operating in the Southwest have continued during this fiscal year. These companies are:

Arkansas-Missouri Power Co.
Arkansas Power & Light Co.
Central Louisiana Electric Co., Inc.
The Empire District Electric Co.
Gulf States Utilities Co.
Kansas City Power & Light Co.
Louisiana Power & Light Co.
Missouri Power & Light Co.
Missouri Public Service Co.
Missouri Utilities Co.
Southwestern Gas and Electric Co.
St. Joseph Light & Power Co.

On January 19, 1953, the Secretary of the Interior disapproved the fundamental principles of a contract which had been negotiated with these companies and submitted to him for his comments and suggestions in January 1952. Under later instructions from Secretary McKay, the Southwestern Power Administration reopened formal negotiations with these companies on April 24, 1953, based on contract principles similar to the "Oklahoma" and "Texas" contracts. At the close of the fiscal year, the negotiations were under consideration by the Secretary of the Interior and his assistants.

PERSONNEL

Total employment in the Administration at the close of the fiscal year was 248 full-time employees. Of these employees, 187 are serving under permanent or probational appointments, 53 under indefinite appointments, and 8 under excepted appointments. One hundred and eighteen employees have veteran's preference, including 116 men and 2 women. Forty-five employees are under the benefits of the Social Security Act and 203 have Retirement Act benefits.

SUPPLY AND PROCUREMENT

Total expenditures for procurement by formal contracts, purchase orders (including standard form No. 44) and blanket purchase agreements, amounted to $1,874,769.

LITIGATION

Kansas City Power & Light Co. et al. v. *Oscar L. Chapman, et al.*, (Civil No. 4276–50, U. S. District Court, District of Columbia). The cause was heard before Judge Charles F. McLaughlin October 13 to October 30, 1952. Thereafter, briefs were filed by the plaintiffs and the defendants, and the court heard oral arguments on January 12, 1953. By order of the court dated June 11, 1953, Secretaries McKay, Benson, and Humphrey, and REA Administrator Nelson were made defendants in substitution for Secretaries Chapman, Brannan, and Snyder, and REA Administrator Wickard, respectively. The cause was authorized to be continued and maintained as against the substitute defendants, and on June 17, 1953, Judge McLaughlin handed down his decision in favor of the Government.

United States v. *Arkansas Power & Light Company.* (No. 14,660 Civil, in the U. S. Court of Appeals for the Eighth Circuit). The Government filed its brief on January 19, 1953, and the appellee's brief and supplemental record were filed on April 13, 1953. The case was argued on May 6, 1953. The decision of the court is pending.

ARKANSAS-WHITE-RED BASINS INTER-AGENCY COMMITTEE

Representatives of the Southwestern Power Administration participated during the year with officials of other departments, bureaus, agencies, and States in plans and studies for the development of the land and water resources of the Arkansas, White, and Red river basins.

Representatives of SPA participated in the activities of the various subcommittees and work groups; directed the activities of the transmission line subgroup of the hydroelectric power work group; and represented the Department on the water use and control task groups responsible for preparing overall tentative basin plans for navigation, flood control, hydroelectric power, irrigation, drainage, and domestic and industrial water supply.

OPERATION AND MAINTENANCE

The transmission system which the Southwestern Power Administration now operates and maintains includes 558.7 miles of 161-kilovolt, 256.5 miles of 138-kilovolt, and 188.6 miles of 69-kilovolt transmission lines; and 26 substations and switching stations together with metering, communicating and protecting equipment in 9 substations of interconnected systems and in 5 Federal hydroelectric plants.

Under construction and scheduled for completion in fiscal year 1954, SPA has 5 switching and substations; namely, Anadarko, Tupelo, Carthage, Clinton, and Springfield, and 2.8 miles of 69-kilovolt line for service to the city of Poplar Bluff. Of the above, the Springfield substation was being operated from the tertiary of the transformer to serve the city of Springfield.

Also during the fiscal year, the generation and transmission cooperatives completed 673.5 miles of 161-kilovolt and 69-kilovolt lines and 29 substations which the Administration operated and maintained under lease agreements. (Operation of these cooperative facilities ceased on July 28, 1953, pursuant to the legislative history of the Appropriation Act for 1954.)

SOUTHEASTERN POWER ADMINISTRATION

Charles W. Leavy, Administrator

POWER RESOURCES

Installed generating capacity

Project	Basin	Kilowatt installed capacity	
		Beginning of year	End of year
Dale Hollow	Cumberland	36,600	36,600
Allatoona	Etowah	74,000	74,000
Center Hill	Cumberland	135,000	135,000
Wolf Creek	do	180,000	270,000
John H. Kerr	Roanoke		108,000
Clark Hill	Savannah		120,000
Total		425,600	743,600

Capacity under construction

Project	Basin	Kilowatt ultimate capacity
Dale Hollow	Cumberland	18,000
John H. Kerr	Roanoke	96,000
Clark Hill	Savannah	160,000
Philpott	Smith	14,000
Jim Woodruff	Apalachicola	30,000
Old Hickory	Cumberland	100,000
Cheatham	do	36,000
Buford	Apalachicola	86,000
Total		540,000

Capacity authorized for construction

Project	Basin	Kilowatt ultimate capacity
Carthage	Cumberland	92,000
Gathright	James	34,000
Celina	Cumberland	64,800
Howell Mill Shoals	Coosa	200,000
Fort Gaines	Apalachicola	130,000
Hartwell	Savannah	180,000
Total		530,800

POWER SALES AND REVENUES

Power sold

Project	Capacity (kilowatts)	Energy (kilowatt-hours)			
		Firm and secondary	Dump	Condenser operation	Total
Clark Hill	76,000	62,225,000	73,300,600	0	135,525,600
John H. Kerr	127,000	165,876,431	49,662,500	15,500	215,544,431
Allatoona	92,200	117,896,000	7,063,000	6,191,000	131,150,000
Dale Hollow	40,000	76,765,000		4,822,000	81,587,000
Center Hill	136,000	247,399,000		19,015,000	266,414,000
Wolf Creek	271,000	625,693,000		29,592,000	655,285,000
Total	742,200	1,425,880,531		59,635,500	1,485,516,031

Purchasers

	Capacity (kilowatts)	Energy (kilowatt-hours)
Clark Hill:		
South Carolina Public Service Authority	40,000	134,974,600
Georgia Power Co	36,000	551,000
John H. Kerr:		
Mecklenburg Electric Cooperative	6,762	15,606,269
Southside Electric Cooperative	7,282	18,427,470
Northern Piedmont Electric Cooperative	2,295	5,652,400
Shenandoah Valley Electric Cooperative	4,224	12,548,800
Virginia Electric Cooperative	5,962	15,029,000
Prince George Electric Cooperative	926	2,179,200
B-A-R-C Electric Cooperative	1,946	3,980,910
Craig-Botetourt Electric Cooperative	1,005	1,363,610
Community Electric Cooperative	2,181	4,015,780
Northern Neck Electric Cooperative	1,773	3,467,461
Central Virginia Electric Cooperative	3,174	6,041,460
Virginia Electric & Power Co	89,470	127,242,011
Allatoona: Georgia Power Co	92,200	131,150,000
Dale Hollow, Center Hill, Wolf Creek: Tennessee Valley Authority	447,000	1,003,286,000
Total	742,200	1,485,516,031

Revenues earned

Project	Revenue this fiscal year	Total revenue to date
Clark Hill	$631,177.30	$631,177.30
John H. Kerr	1,381,234.73	1,381,234.73
Allatoona	954,076.50	3,237,562.57
Dale Hollow, Center Hill, Wolf Creek	1,982,100.00	8,763,600.00
Total	4,948,588.53	14,013,574.60

BUDGET AND STAFF

The Congress appropriated a total of $1,719,500 for the agency to carry out all activities during the fiscal year. The appropriation was divided into a $959,500 allowance for transmission-line planning and construction, a $265,000 allowance for agency operation and maintenance, and a $495,000 allowance for the purchase of firming energy and the payment of wheeling fees. Fifty-six persons were employed by the agency at the beginning of the year. The year was concluded with a total working force of 50 employees assigned to all activities.

PROGRAM ACCOMPLISHMENTS

Operations and planning.—Further progress was made in conducting the extensive hydrologic, economic, and engineering study upon which the proper transmission and disposal of power depends. Work was done to determine operating characteristics of projects, opportunities for integration among projects and river basins, and quantities and kinds of power to become available under widely varying conditions. Firming energy requirements for the projects were studied, and rate-structure determinations were made as allocations of costs to power were developed. Performance definitions were established for transmission facilities required to accomplish integrated operation of projects and delivery of power to purchasers. Data specifying the nature and extent of preference agency loads was collected. Systematic continuation of these long-term tasks was frequently interrupted as the agency's small staff was required to solve the numerous problems raised in arranging for the sale of power which awaits immediate disposal.

CONTRACT NEGOTIATIONS

Negotiations were concluded with the Virginia Electric & Power Co. for the wheeling, firming, and sale of power generated at the John H. Kerr project. A contract was executed providing for delivery to the company's system of two-thirds of the output of the project, wheeling by the company of 60,000 kilowatts of power and energy for sale by the Government to preferred purchasers of Virginia and North Carolina, and sale by the company to the Government of fuel-generated energy to firm the output of the project during periods of low water so that continuous deliveries can be made to those purchasing power from the Government. Power sales contracts were executed with 11 rural electric cooperatives of Virginia and service to them from the Kerr project begun.

Negotiations were concluded with the South Carolina Public Service Authority on the sale of Clark Hill power. A contract for 40,000 kilowatts of power and energy was executed and service begun through the authority's own interconnection with the project. The terms and conditions to govern an additional sale were under negotiation at the year's end.

Additional capacity installed at the Clark Hill project during the year increased the output of power and energy to an amount in excess of that which could be delivered under existing contracts with preferred purchasers. A short-term interim agreement for disposal of the excess was executed with the Georgia Power Co. Its long-term disposition was undergoing determination at the end of the year.

A short-term, interim agreement was executed with the Appalachian Electric Power Co. for sale of the entire output of the Philpott project, pending a determination of long-term disposition arrangements for the power.

Wheeling and firming arrangements were discussed throughout the year with the private utility companies of the Southeast.

CONSTRUCTION

Federal court order enjoined further construction by the Government on the 41 miles of transmission line from the Clark Hill project to the Greenwood County Electric Power Commission begun in the previous year. Fiscal year 1953 ended with mature prospects for an early disposal of the partially constructed line to the commission.

OFFICE OF TERRITORIES

William C. Strand, Director

Human progress made healthy strides in the territories during the fiscal year 1953, in areas varying widely in clime and custom. In the frigid winter of Alaska, in the year-round warmth of the Caribbean, in the Pacific Islands where the currency is stone, there was a forward motion to the current of human events and livelihood.

The Alaska Railroad carried a record volume of freight and passengers during the year and work was pushed on new highways. The pros and cons of statehood for both Alaska and Hawaii continued to be argued and considered. The Commonwealth of Puerto Rico was established, enjoying full self-government under a constitution drafted and adopted by the people of Puerto Rico, in a unique relationship with the United States. The tourist industry continued to expand and to develop as the most important economic activity of the Virgin Islands. Thousands of miles away, the people of Guam, American Samoa, and the Trust Territory of the Pacific Islands continued to devote their energies toward the attainment and exercise of increasing degrees of self-government.

The American traditions of economic and political freedom and self-determination guide the policies and work of the Office of Territories. Thus the peoples of the territories are constantly encouraged to advance toward economic security and political maturity. This does not mean that "Made in U. S. A." can be stamped on the people of the territories, even on those who are citizens of the United States, nor does the Office direct its energies toward accomplishing uniformity. The people of the territories differ from one another and from the people of the mainland in many respects; race, creed, and custom. These differences are cherished and preserved. Islanders in the Trust Territory of the Pacific Islands continue the customs of their forefathers, and indeed recognition is given to those customs in the laws promulgated by the representatives of the United States as administering authority.

The people of the territories want our guidance, but they do not want paternalism. They are determined to reach ever higher plateaus of prosperity and freedom through their own energy and initiative. That their efforts are successful becomes apparent as a Guamanian rises in his legislature and quotes Voltaire in debate, as college-trained Eskimos return to their villages to teach their people, and as children of complex racial ancestry march together into classrooms in Hawaii.

In the territories, as on the mainland, there was a change in leadership during the year. New chief executives were inaugurated in Alaska, Hawaii, Guam, American Samoa, and the Trust Territory of the Pacific Islands. These new representatives of the Federal Government have pledged themselves, as has the Office of Territories, to guide and assist the territorial peoples in their drive toward economic and political self-sufficiency.

ALASKA

B. Frank Heintzleman, appointed Governor by the President, was inaugurated in Juneau on April 10, 1953.

Statehood

Legislation to provide for the admission of Alaska to the Union and to provide for an elective governor and secretary for Alaska was introduced in the 83d Congress. No definitive action had been taken by the Congress on either measure at the end of the fiscal year.

Territorial Legislature

Outstanding accomplishments of the 21st territorial legislature in session during February and March 1953 include the creation of a department of public lands and a department of territorial police. The department of public lands, headed by a land commissioner, is charged with custody of land-registration records, the administration and leasing of lands held by or reserved to the Territory, and the drafting of legislation to be presented to the 22d legislature covering appraisal, leasing and sale provisions for territorial lands. The statute will provide the basis for the effective utilization and management of lands granted to or otherwise acquired by Alaska.

The territorial department of police is charged with the enforcement of all criminal laws within Alaska and will supplement existing Federal and municipal law-enforcement staffs. The basic responsibility for law-enforcement activities outside incorporated communities has hitherto rested almost exclusively with the United States

Department of Justice, the outstanding exception being the Alaska Highway Patrol, created by the Territory in 1949. A detective bureau, a central bureau of identification and information, and a criminal detection laboratory are provided for in the law setting up the police department.

Expanding Demand for Alaska Coal

The mining of coal has become a major Alaskan industry in which the Federal Government, through its ownership of territorial coal lands, is in partnership with private enterprise. In order to improve the quality of its assistance to the industry, the Department, in the late summer of 1953, planned a field survey of supply and demand factors that affect the production and marketing of Alaska coal. The survey will include studies of military and civilian requirements; existing mine capacity; need for new mines; transportation, manpower and financing problems; and a review of Government leasing regulations and conservation practices. The study has been prompted by the fact that the rate of expansion of Alaska coal production during the past fiscal year was not great enough to meet estimated requirements.

Territorial Health Programs

This Department has contracted with the University of Pittsburgh Graduate School of Public Health to make a comprehensive study of health problems in Alaska. The agreement provides for the collection and analysis of data on the general health and hospital problems of the native and nearby white populations, as well as a study of health facilities and services now provided by the Federal and Territorial governments and by private individuals and organizations.

The University of Pittsburgh will conduct two field surveys in the Territory. One of the most important results of the studies, which are to be completed by December 31, 1954, will be recommendations as to Federal, Territorial, and private responsibility for and participation in an Alaskan health program.

The contract between this Department and a private company which provided, pursuant to statutory authorization, for the care and treatment in continental United States of the Alaska insane, expired on June 30, 1953, and in response to the call for bids, the holder of the existing contract was the only bidder. After negotiations for the purpose of agreeing on more satisfactory terms, a new contract for a 5-year period was signed on June 18, effective July 1, 1953. After 1 year, however, the contract can be terminated by either party on 6 months' notice.

Alaska Public Works

The Alaska public-works program, in its third full year under the Office of Territories, continues to provide such essential facilities as schools, sewer and water systems, health centers, and other public works at a price to Alaskan communities averaging 50 percent of cost. This program was established by Public Law 264, 81st Congress.

Construction work has been substantially completed on all of the 19 projects totaling $4,900,000, which had been allotted prior to June 30, 1950. Six of the twelve projects of the 1951 program, totaling $4,100,000, have been completed and the balance should be completed during the present construction season. All of these projects were certified as of value to defense, as required by the 1951 Appropriation Act.

Construction on all but 1 of the 15 projects in the 1952 program, totaling $6,421,000 is well under way, with 5 completed and the balance averaging 82 percent completed. Of the 15 projects of the 1953 program amounting to $12,023,900, construction is under way on 10. Early bid openings are scheduled on 4 of the remaining 5 projects.

The 83d Congress has appropriated $12 million for the 1954 program.

The Alaska Railroad

The Alaska Railroad carried a record volume of freight and passengers during the year, with revenues 10 percent and volume 18 percent above 1952. The big news, however, was the virtual completion of the rehabilitation program for all except the Seward end of the line, and the replacement of the Anchorage shops lost by fire in 1951 with steel and concrete buildings. Major items of new equipment placed in operation are 2 river boats and 2 petroleum barges for service on the Yukon and Tanana Rivers, and 6 diesel locomotives which spell the end of the use of steam power on scheduled runs from Seward and Fairbanks. Increased travel demands and the economy of diesel power permitted daily passenger service between Anchorage and Fairbanks to be continued through the winter months for the first time in the history of the railroad.

The Knik Arm powerplant, jointly owned by the railroad and the Chugach Electric Association, has been completed. It is being operated for the railroad by the Bureau of Reclamation under an approved agreement.

The McKinley Park Hotel, after many years of operation by the railroad, has finally been leased to a private concessionaire.

The railroad has been required by the Interstate Commerce Commission to cease publication of through rates to Pacific coast ports under any kind of Interstate Commerce Commission sponsorship.

The Federal Maritime Board has taken jurisdiction over the ocean portion of the haul and the steamship companies are now filing proportional tariffs with that body. For the convenience of shippers, the railroad is now publishing, on its own, a memorandum tariff showing through rates as the sum of the proportional rates of the participating carriers.

On June 18, 1953, a fire destroyed the dock facilities of the port of Whittier which is used for the movement of military cargo to interior Alaska via The Alaska Railroad. It immediately became necessary for Seward, despite the limitations of its already inadequate facilities, to handle military cargo in addition to all civilian cargo destined for the railbelt. In view of the need to insure maximum use of Seward during the period required to restore Whittier to its former capacity, the Congress was requested to appropriate funds to initiate construction of new dock facilities in fiscal 1954. Funds for the survey and design of such facilities had been requested for 1954 and the construction item was included in an amendment to the Interior appropriation act presented upon the floor of the Senate. The Whittier fire has provided dramatic peacetime support for the position of the military that the port of Seward, as well as Whittier, is necessary for the defense of Alaska.

Progress of the Alaska Road Commission

The Alaska Road Commission has continued to emphasize its three basic policy goals: (1) Interconnecting presently isolated road systems and centers of population; (2) extending feeder roads into developing areas of farming, mineral, and industrial potentials; and (3) paving and otherwise improving the integrated through-highway system. At the end of the fiscal year the Road Commission maintained a total of 3,422 miles of road, 1,711 of which were kept open to traffic despite severe winter conditions; 91 miles of new roads were constructed, 284 miles of main highways were improved to a 50-mile per hour standard, and 137 miles were surfaced with a flexible asphalt mat surface, increasing the total paved system to 577 miles.

Work has started on the new 117-mile Copper River Highway which will provide the interior of Alaska with access to its fourth ice-free, year-round port, Cordova. The 160-mile Taylor Highway was opened to the Yukon River. This highway, together with a branch through Canada's Yukon Territory to Dawson, will make possible the development of a highly mineralized area. The Denali Highway, terminating at McKinley Park, is now one-third complete. A new bridge across the Chena Slough at Fairbanks is being built to relieve traffic and provide by-pass connections, and an 8-mile by-pass in the Anchorage area around Fort Richardson and Elmendorf Air Force Bases has been opened to traffic.

The most spectacular winter operation of the year involved snow removal at Thompson Pass on the Richardson Highway. Over 81 feet (980 inches) of snow fell in the pass and winds exceeding 100 miles an hour were experienced with temperatures dropping below −50° F.

The traffic census continued by the Commission shows a rapidly increasing vehicle count for all of the interconnected highways. Increased highway use has meant larger maintenance costs, both to protect the investment in the highways and to provide safe conditions for the traveling public. The traffic-safety program of the Commission has included improved highway signs throughout the system, centerline striping of the principal routes, safety patrols during extreme subzero temperatures, the erection of guardrails, and the rigid control of highway loads, especially during the spring thaw periods.

Other Transportation Developments

Rail-barge service has been inaugurated from Seattle to the pulp plant at Ketchikan (now under construction) while similar service is planned for Juneau with its developing forest-products industries. The use of rail-barges is expected to result in lower costs and may enable the forest products of southeastern Alaska to enter United States markets on a competitive basis.

Transportation services between Ketchikan and Prince Rupert, British Columbia, were improved by the certification of a Canadian airline to serve the two communities on a regularly scheduled basis. The Canadian service will supplement service between the two communities by an Alaskan airline. Ketchikan is the site of the Territory's only pulp plant and is a major fishing and tourist center. Prince Rupert is a transportation center and a rail-port of the Canadian National Railways.

Fellowships

Two Alaskans received United Nations fellowships in the 1953 program designed to provide study and training abroad in the general fields of social welfare, economic development, and public administration. The first award provided for study of community organization and fishing cooperatives in Nova Scotia. The second provides for a study of the rural school systems of Australia.

CARIBBEAN TERRITORIES

Commonwealth of Puerto Rico

Achievement of internal self-government.—On January 19, 1953, the Honorable Henry Cabot Lodge, the United States Ambassador to the United Nations, officially notified the Secretary-General of the United Nations of the decision of the United States to cease reporting on Puerto Rico as a non-self-governing Territory. Under the new Commonwealth constitution which became effective on July 25, 1952, the people of Puerto Rico have attained self-government. It is therefore the position of the United States that it is no longer appropriate to continue to report on Puerto Rico as a non-self-governing Territory under article 73 (e) of the United Nations Charter.

The events leading up to this signal change in the status of Puerto Rico were outlined in the 1952 annual report. A constitution for the Commonwealth was drafted by delegates elected to a constitutional convention and was submitted to the people of Puerto Rico in a public referendum on March 3, 1952. It received overwhelming approval and, before going into effect on July 25, was submitted to the President and was approved by the Congress of the United States.

Under the new constitution the executive responsibility rests in a governor elected every 4 years by the citizens of Puerto Rico. Legislative responsibility is lodged in a legislative assembly which consists of a senate and a house of representatives. Legislators are popularly elected for 4-year terms. The judiciary consists of a supreme court and such inferior courts as may be established by the legislative assembly.

A memorandum dealing with the constitutional development of Puerto Rico, and with the island's present status, was submitted to the United Nations by the Department of State. The memorandum was based in large part on material prepared by this Department and was discussed with representatives of the Commonwealth government and of this Department. It is expected that the question of cessation of reports on Puerto Rico to the United Nations will be an item on the agenda of the General Assembly at its eighth session.

Puerto Rico Reconstruction Administration.—By letter of June 20, 1953, President Eisenhower requested the Department to develop a program for the more rapid liquidation of the Puerto Rico Reconstruction Administration, an agency established in the Department by Executive order in 1935 to provide a program of useful works and employment in Puerto Rico. The activities of the agency have been reduced for the most part to the management of various urban and rural housing projects. The new program contemplates a speeding up of the liquidation process until all financial interests of the United

States in the projects are disposed of. Congressional approval of and authorization for the final liquidation will be sought.

Operations during the fiscal year were financed from the revolving fund in accordance with allotments by the President totaling $776,600. Essential projects for the fiscal year 1954 are being continued with allotments aggregating $463,000 out of the revolving fund. That fund derived exclusively from PRRA operations had a net available balance on June 30, 1953, of $3,172,389, of which $720,613 were collected during the fiscal year.

Technical assistance through the training of foreign nationals.—Since June 1950 Puerto Rico has been used as a training ground for foreign nationals under the technical-assistance programs of both the United States and the United Nations. The program is administered through a coordinating office in the Department of the Interior and the Office of Technical Cooperation in San Juan under the supervision of the Puerto Rico Planning Board. The Government of the Commonwealth appropriated $35,000 for technical assistance in 1953 and, in addition, absorbed nearly all costs in the various Federal agencies without reimbursement.

Under these programs a total of 373 trainees, visitors, and observers were on the island during fiscal 1953. Specific areas represented by the 347 trainees include all the Latin-American countries, other Caribbean areas, 11 Near East and African countries, Burma, Formosa, Indochina, Indonesia, the Philippines, Thailand, Japan, India, Pakistan, and Nepal.

Individuals and groups of special note among the foreign nationals included the Director General of the Civil Service Commission of Thailand; the Secretary of the Ministry of Works, Housing, and Supply of India; a team of provincial governors and tax officials from Thailand; labor union leaders from the Far East and Latin America; and a group of five French officials connected with the Ministry of Overseas Territories.

In addition to individual grants made by the Technical Cooperation Administration and the Mutual Security Agency, a number of group projects were carried out. MSA approved $96,000 for the vocational training of 75 students from the Caribbean dependent areas of Great Britain, France, and the Netherlands. Two special sessions for the training of 16 Latin-American labor leaders were financed by TCA. Other special projects included a contract by TCA with the University of Puerto Rico in the amount of $20,000 for the translation of selected public administration literature from English to Spanish for distribution in Latin America.

While the Commonwealth provided training under United Nations and United States programs, it also received technical assistance from the United Nations. As a matter of policy, the United States Government applies for such assistance only on behalf of its Territories and the Commonwealth. Through such applications, three United Nations fellowships were awarded to employees of the Commonwealth.

The Virgin Islands

Hearings on Organic Act.—On April 30, 1953, a public referendum was held to determine, for the use of the President and the Congress, the opinions of citizens of the Virgin Islands on the basic structure of their Government. The referendum resulted in an affirmative vote on four points: (1) Creation of a single legislature for the islands, (2) creation of a single treasury, (3) election of the Governor, and (4) election of a Resident Commissioner to sit in Congress but without a right to vote.

Hearings on bills to revise the Organic Act, H. R. 5181, H. R. 5608, and H. R. 5835, were conducted by the Subcommittee on Territories of the House Interior and Insular Affairs Committee in Washington, D. C., during June 1953. H. R. 5181 was drafted and submitted to Congress by this Department. If enacted, the bill will abolish the present two municipalities with their duplicating and overlapping functions and agencies, and establish a single legislature in lieu of the present three legislative bodies. It will also provide for an elected Resident Commissioner to represent the islands in the Congress. The bill makes no change in the judicial system. The Governor will continue to be a Presidential appointee, and will have authority to reorganize the executive branch of the local government. Finally, the bill provides for the return to the treasury of the Virgin Islands of all but 1 percent of the proceeds of the United States internal revenue tax on articles produced in the islands and sold in the United States. A similar tax provision has been in force for Puerto Rico for many years.

The Legislative Assembly of the Virgin Islands, consisting of the members of the two municipal councils, sponsored another bill to revise the Organic Act, which was introduced by the chairman of the subcommittee on Territories of the House Interior and Insular Affairs Committee, who also introduced a bill offered by the chamber of commerce of the islands. All three bills have much in common, and it is anticipated that a consolidated bill will be reported by the subcommittee.

The Virgin Islands Corporation.—The close of the fiscal year 1953 marked the fourth anniversary of the Corporation's 10-year charter.

The Corporation continued to improve and develop its production of sugarcane for the manufacture of raw sugar and molasses. As of

June 30, with the season not yet complete, the 12,000-ton quota had already been exceeded, setting a high mark in this field of operations for St. Croix during this century. This production record was achieved in spite of the handicaps of an extreme and protracted drought for over 6 months, and the lack of certain items of new and improved factory machinery with which even greater yields could have been attained. It is expected that new machinery will be installed during the coming fall season, to be ready for next year's crop. Unit costs of various operations in both field and factory were reduced even in the face of substantial increases in wages required under the Production and Marketing Regulations of the United States Department of Agriculture.

The Corporation has completed its first year of managing the generation, distribution, and sale of electric power for the entire island of St. Croix. There has been a large increase in the amount of power produced, as well as in the number of consumers served. The operation is paying its way in all respects and is showing a profit, in spite of an appreciable reduction in rates to consumers. A new diesel generating unit has been installed in the St. Croix Power Division, thereby increasing its capacity by 70 percent to a total capacity of 1,861 kilowatts.

On December 1, 1952, the Corporation purchased the St. Thomas Power Authority, at the request of the municipality of St. Thomas and St. John, and is now responsible for the production, distribution, and sale of electricity for that island. Substantial additional generating and distribution capacity has been and is being installed in the St. Thomas Power Division and the production and sale of power have been greatly increased. The power facilities in St. Thomas were inadequate and in poor condition when the Corporation took them over. This Division is also showing a profit in its operations.

Last September, the Corporation leased about 50 acres of land and buildings to the Department of Agriculture for the establishment of the new agricultural experiment station in St. Croix. Under the terms of a cooperative working agreement with the USDA, several field experiments in the use of fertilizer, in weed and brush control, and in livestock breeding, have been started and are presently well under way.

During the year the Corporation continued its experimental activities in short-season vegetable crops with results varying from failures to moderate successes. A commercial-scale plot of 100 acres of beans will be grown during the coming winter months in order to determine whether beans can be used to augment the present one-crop sugar economy.

The Corporation has continued and has expanded its program of grants for land and water conservation on St. Croix. Over 20 large earthen dams for the impounding of water have been built, and several hundred acres of pasture land cleared for improved cattle production. Plans have been completed for the extension of most of the program to St. Thomas, commencing July 1953.

Development of tourism.—The tourist industry continued to be a leading economic activity in the Virgin Islands. It is estimated that $5 to $6 million are spent by tourists each year. Approximately 32 percent of the labor force in St. Thomas during the winter season are directly engaged in tourist industries, and St. Croix has also benefited greatly from the growing tourist business.

An important factor in the growth of tourism has been the improvement in tourist facilities. Hotel accommodations, which in 1945 could take care of only about 200 guests, have been expanded so that they now provide for about 1,500 guests. An increasingly large number of mainland citizens are establishing permanent year-round homes in the islands.

Public works.—A modern 116-bed hospital for St. Thomas, and a 60-bed hospital in Christiansted, St. Croix, have been completed and are about to go into operation. Public-health facilities—1 with 12 beds at Frederiksted, St. Croix, and another with 4 beds at St. John—were finished and are in use. Work has started on 2 high schools—one for 1,200 pupils in Charlotte Amalie, and 1 for 600 students in Christiansted.

PACIFIC TERRITORIES

Hawaii

On February 28, 1953, Samuel Wilder King was inaugurated as Governor of Hawaii. Governor King is the first part-Hawaiian to occupy this important Territorial post.

As in previous years, the Department's efforts for Hawaii throughout the period of this report were concentrated on securing passage of statehood legislation. Such legislation was introduced early in the 83d Congress. The President's State of the Union message urged enactment of a statehood bill, and H. R. 3575, under which Hawaii would be admitted to the Union in 1954, passed the House on March 10, 1953. At the end of June hearings on this bill by the Senate Committee on Interior and Insular Affairs had not been concluded. The question of Hawaiian statehood was taken off the list of "essential" legislation for the first session of the Congress, but it was announced that it would have a high priority when the second session opened.

Several Executive orders of the President, proposed by the Department, restored to Hawaiian control lands in the Territory which were under the jurisdiction of Federal agencies which no longer needed them. This action was based on the recommendations of a Land Use Committee composed of military and Territorial officials which has completed a report on the relative need for military and civilian uses of lands controlled by Federal agencies.

Public Law 587 of the 82d Congress, which had the active support of the Department, authorized the Secretary of the Treasury to make agreements with States and Territories that income taxes imposed by Territorial law might be withheld from the salaries of Federal employees whose place of work is within such States or Territories. Hawaii, like many of the States, has in the past encountered considerable difficulty in collecting such taxes.

Guam

Ford Q. Elvidge, who was appointed by the President as the second civilian Governor of Guam, took the oath of office in Washington on March 27, 1953, and was inaugurated in Agana on April 23, 1953.

Federal laws for Guam.—For Guam, as for Hawaii, the Department's major activity during the year was in the field of legislation, and several Federal laws of particular importance to the Territory were passed.

The Housing Act of 1949 was amended to permit residents of Guam to become eligible for home-mortgage loans insured by the Federal Housing Administration. A severe housing shortage is responsible for the importance attached to this amendment.

The Immigration and Nationality Act of 1952 made the immigration laws of the United States applicable to Guam. Since December 24, 1952, the effective date of the act, Federal officials of the United States Immigration and Naturalization Service have been enforcing these laws in the island. In view of this development, the Department formally requested the Department of State to rescind the regulation requiring United States citizens and nationals to carry passports when traveling between Guam and other parts of the United States. Action on this request had not been taken by the end of the fiscal year.

The national school-lunch program was extended to Guam and funds to support it were included in the 1954 Agriculture Department Appropriation Act. The Department supported the extension of this program on behalf of the government of Guam and assisted in making arrangements for a representative of the United States Agriculture Department to initiate it in September 1953.

Other amendments to Federal laws recommended by the President's Commission on the Application of Federal Laws to Guam were embodied in the Guam omnibus bill, H. R. 6808, introduced in the 82d Congress. This bill received the full support of the government of Guam and the Interior Department, but the Congress adjourned before taking final action on it. The bill is being revised for possible reintroduction in the 83d Congress.

Meeting the needs for utility expansion.—The public utilities section of the agreement entered into by the Departments of the Navy and Interior in 1950 when the civil government responsibility was transferred to the latter, received considerable attention during the year due to increasing civilian needs for power and other utility services.

Studies of military and civilian requirements for electrical power over the next 5 years were made both by the Navy and by the Territorial government. To assist in the Territorial study, the Department made available the services of the Chief Engineer, Division of Water and Power. Following consultation with this Department and pending formal modification of the 1950 agreement, the Navy Department in May 1953 agreed to a program for increasing the allocation of power to the government of Guam which is expected to meet all foreseeable civilian needs.

Toward the end of the fiscal year, Navy representatives in Guam also agreed to a substantial increase in the allotment of water for civilian use.

A decision was reached by local military and civilian authorities whereby the government of Guam would install a telephone system for civilians which, while independent of the military telephone exchange, would be integrated with that system for islandwide use.

It is expected that a formal modification of the interdepartmental agreement will be negotiated in Washington by representatives of the Navy and Interior Departments early in fiscal 1954 to take into account these cooperative arrangements.

Legislative interests in the future.—Among the measures for which the Guam Legislature has petitioned the United States Congress but with respect to which that body has taken no action are (1) an amendment to the Organic Act to provide for a Resident Commissioner, (2) an amendment to the Organic Act to permit legislators to be elected on a municipal rather than a territorywide basis, and (3) a law to authorize the appointment of cadets and midshipmen to the United States Military and Naval Academies. The Second Guam Legislature enacted a military code in anticipation of the creation by Congress of a

Guamanian National Guard unit. These are among the subjects with which the Department will be concerned on behalf of Guam in the year to come.

American Samoa

Lawrence M. Judd was named by the Secretary as Governor of American Samoa and was inaugurated on April 17, 1953. He assumed the governorship as the Territory was completing its second year under civilian administration.

One of the most significant achievements of the year was the reorganization, with the approval of the Secretary, of the Fono, which is the Samoan advisory legislative body. The reorganization plan, initiated and drawn up by the Fono itself, called for greatly reduced membership of both houses of the Fono and secret elections under universal adult franchise for membership in the lower house. Members of the upper house would continue to be selected in open meetings in the traditional Samoan manner. Never before in the history of American Samoa had secret ballots been used for elections to the Fono. The elections were held in January 1953, 65 percent of the eligible voters registered to vote, and the newly elected Fono convened in February.

The judicial branch of the Territorial government was also reorganized. Changes were based on recommendations made by Judge Albert B. Maris, of the United States Court of Appeals for the Third Circuit, who visited the Territory in 1952 at the request of the Department to survey the judicial system.

In accordance with departmental policy, Samoans, as they become qualified, are being appointed to positions of authority in the executive branch of the Territorial government. Thus two Samoans, with advanced degrees from continental United States universities, were appointed respectively to the positions of public defender and assistant personnel director.

The problem of organic legislation continued to receive attention. The Fono requested the Department to withhold submission of such legislation until the Samoan people were given an opportunity to consider the proposals that have been made, and indicated that they would discuss the matter in formal session in 1954. The Department agreed to postpone action until the Fono submits its views.

The need for developing a self-supporting economy both as an end in itself and as a basis for the further growth of local self-government has been of concern to the Department. It is futile to attempt to erect a structure of government in Samoa which the local economy cannot support at some time in the future. Furthermore, Samoans can hardly be given local authority over governmental funds to which they are unable to contribute a reasonable share.

To explore these problems, a plan for an economic survey of the Territory has been worked out by the government of American Samoa, in cooperation with the Office of Territories. Funds for this purpose have not yet been made available but it is hoped it will be possible to undertake such a survey within the coming year.

Great hopes are held for the development of a Samoan fish-canning industry. A call for bids for leasing the idle cannery in Tutuila was issued by the Department on behalf of the Territorial government in the fall of 1952, but the bids received were not responsive. A new invitation has been issued and it is hoped that it will be possible to sign a lease during 1953.

Early in 1953 two water-research experts from the United States Geological Survey made a reconnaissance survey of ground and surface water supply problems. Their report is expected to recommend a continuing program for gathering water data, together with immediate steps to improve the volume and quality of water supply facilities. The Geological Survey is also exploring means of preparing topographic maps of the Territory.

The Department considers that the improvement of the transportation services between the Territory and other parts of the world is basic to an improvement in economic conditions. For this reason, it has urged the need for air service to Tutuila in the case of two applications before the Civil Aeronautics Board.

Trust Territory of the Pacific Islands

The second year of civilian administration in the Trust Territory of the Pacific Islands was marked by steady economic and political progress. A basis was established for resolving, at a Federal level, long-standing problems which have been impeding efficient operations. Their solution is dependent upon closer relations between State, Defense, and Interior Departments. One of the first acts of the new administration was to lay the foundation for an Inter-Agency Pacific Islands Coordinating Group at the Assistant Secretary level to consider problems of interest to all three departments.

The Trust Territory was somewhat handicapped in its operations by restrictions placed in the Interior Department Appropriation Act, 1953, and by lack of funds to replace public buildings and utilities which have outlived their usefulness. The replacement of these buildings and utilities is becoming increasingly urgent.

On March 13, 1953, Frank E. Midkiff was appointed the second civilian High Commissioner of the Trust Territory.

On November 29, 1952, the President approved Dublon in the Truk Atoll as the permanent headquarters site of the Territorial government. In the past, as at present, no move has been possible for lack of funds with which to construct housing, office, and other facilities. In the meantime, the decision to establish headquarters on Dublon is under review.

Transfer of Saipan and Tinian to the Navy.—By Executive Order No. 10408 of November 10, 1952, responsibility for the administration of the islands of Saipan and Tinian was transferred back to the Department of the Navy, effective January 1, 1953. This Department opposed the issuance of the order but the transfer was deemed necessary for security reasons.

Since the islands immediately to the north are closely tied into the economy of Saipan and can be more readily administered therefrom, this Department proposed, and toward the end of the fiscal year the Department of Defense sponsored, a complementary Executive order for the purpose of transferring these 17 remaining islands and islets in the Northern Marianas to the Navy Department for administration. It was requested by this Department that the island of Rota, which is nearer to Guam than Saipan, not be included in this transfer. It is the belief of this Department that the Trust Territory as a whole should be under a single administration. However, the transfer of Saipan and Tinian back to the Navy requires that the remainder of the group, with the exception of Rota, should follow for efficiency and economy of administration.

Organic legislation proposed.—A proposed organic act for the Trust Territory was recommended by the Department to the 83d Congress. The bill was reviewed by the new High Commissioner after discussion of its provisions with local leaders, and a number of amendments were proposed. Hearings were scheduled at an early date in fiscal 1954. Pending passage of such legislation, the Senate approved Senate Joint Resolution 6 to provide continuing authority for the administration of the Trust Territory and to authorize appropriations for the Territorial government. The resolution was before the House Committee on Interior and Insular Affairs at the end of the fiscal year.

In its report on the resolution, the Department recommended an amendment extending the life of the Island Trading Company. The amendment would also provide that all assets remaining after deposit in the Federal Treasury of the $1,801,934 which the company owes the United States Government, be available to the Trust Territory government for credit purposes to insure the continued flow of trade in the area. The Interior Department Appropriation Act, 1953, included a provision requiring the liquidation of the Island Trading Company by December 31, 1953, and the deposit in the United States Treasury of all balances remaining after liquidation.

The High Commissioner is taking active steps to turn over, as rapidly as possible, to local Micronesian companies functions heretofore performed by the Island Trading Company.

Review by the United Nations.—As in previous years, a detailed review of the administration of the Trust Territory was undertaken by the Trusteeship Council of the United Nations in May and June. A United Nations visiting mission traveled throughout the Territory in February and March of 1953.

Two Micronesian advisers assisted the United States delegation to the Trusteeship Council during consideration of the reports on Micronesia. The Department of State designated these advisers in accordance with a resolution adopted by the United Nations General Assembly in 1952. The United States is one of the first nations to include local advisers on its official delegation to the Trusteeship Council when annual reports are being considered.

Petitions received by the visiting mission during its trip through the Territory covered such subjects as claims against Japan and the United States for combat and noncombat damage, including sequestered yen; land claims; and the return of Japanese repatriates who have immediate families in the Territory. The Department collaborated with the High Commissioner and the Department of State in preparing observations on the petitions.

South Pacific Commission

Representative inhabitants of American Samoa, Guam, and the Trust Territory of the Pacific Islands attended the Second South Pacific Conference at Noumea, New Caledonia, in April 1953. This conference, which meets every third year, is sponsored by the South Pacific Commission, an international advisory body established to promote the economic and social development of Pacific territorial peoples.

Research and technical assistance made available by the Commission to American Samoa, Guam, and the Trust Territory of the Pacific Islands included projects concerned with copra production, leprosy, nutrition, cultural change, and credit facilities.

Other Pacific Islands

This year, for the first time, the Office of Territories employed a full-time teacher for children on Canton Island, paid from funds appropriated by Congress. On various occasions during the year, the Department consulted with the Department of State on matters pertaining to disputed islands in the Pacific.

DEFENSE ELECTRIC POWER ADMINISTRATION

James F. Davenport, Administrator

During the fiscal year ended June 30, 1953, the Defense Electric Power Administration continued to perform the functions delegated to it under the Defense Production Act of 1950, as amended, and related legislation, with respect to expansion of electric power supply to assure adequate power for the Nation.

The revised power expansion goal called for the installation of 41 million kilowatts of new generating capability by the end of 1955. Attainment of this goal would increase the national generating capability from 75 million kilowatts at the end of 1951 to 116 million kilowatts at the end of 1955. 1952 installations were 6.5 million kilowatts. DEPA estimated that new installations would add 9.5 million kilowatts in 1953, 10.5 million kilowatts in 1954, and 12 million kilowatts in 1955. Together, these would bring total capability to 113.5 million kilowatts by the end of 1955, as compared with the goal of 116 million kilowatts. In arriving at its estimates of capability to be installed in 1953 and subsequent years, DEPA had estimated and taken into account anticipated slippages in scheduled installations. DEPA did not anticipate that the slippages in 1952, 1953, and 1954 will be made up until 1956. The slippages for 1953 and 1954 are attributable in part to the shortages of materials in late 1952, resulting from the steel strike in the summer of 1952, and in part to the inability of some manufacturers to meet their production schedules due to difficulties within their own shops.

DEPA estimated that during 1953 and part of 1954, there may be some areas of the country where total load requirements cannot be met. This situation will be corrected in late 1954 and in 1955 if the equipment manufacturers' present shipping schedules are as anticipated. The outlook for the Pacific Northwest region is not good, since presently authorized installations will barely meet the growing load requirements of the area.

Low stream flows in the Pacific Northwest, with consequent lower output of hydroelectric plants, indicated that power resources would not be adequate to carry loads. Therefore, DEPA during the summer of 1952 made plans to administer a conservation and curtailment program. In October 1952 the Administrator established a Northwest Advisory Committee. On October 29, 1952, DEPA issued Order EO–4A which generally described the nature of the conservation program. Direction 1 under the order was issued November 1, prohibiting deliveries of interruptible power. Direction 2 under the order was issued effective November 17, activating the quota procedure, and limiting consumption of consumers using more than 8,000 kilowatt hours per week to 90 percent of the kilowatt hours used in the corresponding period of the previous year. The quota limitation was applied to all industries alike, pursuant to advice from the Office of Defense Mobilization that the output of no one or more of the industries which would be affected was sufficiently more important to national defense than the others to warrant preferred treatment. The operation of the conservation program was successful in restricting loads to the supply of electric power available. Direction 2 was revoked on January 13, 1953; Direction 1 was temporarily suspended on January 16, 1953, and Order EO–4A expired by its terms on April 30, 1953.

During the last quarter of 1952 and as late as January 1953, the effects of the 55-day steel strike caused serious slippage in production schedules of heavy power equipment which in turn caused deferment in scheduled operating dates of new generating capacity being installed. The inability of manufacturers to procure certain materials for the production of power equipment and to ship on dates previously scheduled caused more delays to the power program than were caused by the inability to procure necessary materials to meet field construction schedules.

Because of indicated delays in the completion of generating facilities, AEC requested that the E rating be used for construction of power plants associated with power supply for its program. DEPA recognized the necessity of priority assistance for this segment of the power program. It believed, however, that if only the AEC-related portion of the program were accorded such treatment, there would be a resultant slippage in other electric power projects upon which the military is dependent. Therefore, DEPA strongly favored priority assistance for the whole of the power program. While the Munitions Board recorded its view that military production depended on timely completion of the power program as a whole, as distinguished from separate, identifiable units within the program, it was unwilling to concur in the extension of the military-AEC ratings to the entire program and requested, instead, that equivalent measures be taken through directives. On February 12, the National Production Authority granted, and, on the same date, DEPA extended to 50 power projects associated with AEC power supply the authority to use the E–5 program identification replacing the H–3 rating. With respect to directive action for the balance of the electric power program, it was NPA's judgment that no general production directives were necessary because through other measures taken by NPA, the materials requirements of the entire program would be met.

Through June 30, 1953, applications for certificates of necessity for rapid tax amortization for 870 electric utility projects and 42 industrial powerplants were received. Of these, 666 and 39 respectively were recommended for approval. Construction of these facilities for which accelerated tax amortization was granted will increase the Nation's electric power supply from electric utilities by 23,440,855 kilowatts and from industrial powerplants by 844,150 kilowatts.

With the decreased workload resulting from the improved material and equipment supply situation and from the philosophy of reducing controls to a minimum, DEPA was abolished effective June 30, 1953, by Interior Order No. 2721, dated May 7, 1953. Residual DEPA functions will be handled under the direction of the Assistant Secretary of the Interior for Water and Power.

DEFENSE MINERALS EXPLORATION ADMINISTRATION

C. O. Mittendorf, Administrator

The Defense Minerals Exploration Administration, established on November 20, 1951, by the Secretary of the Interior, carries out a program pursuant to a delegation from the Defense Materials Procurement Agency, to discover and develop in the United States, its Territories and possessions, deposits of strategic and critical minerals vital to our national security.

Under this program, the Government, through DMEA, furnishes financial aid to the mining industry, particularly to the small operator, on a participating basis of 50, 75, or 90 percent of the cost of an exploration project, depending upon the mineral sought. Funds to cover the Government's commitments for its share of the cost of exploration projects are made available under the borrowing authority provided by the Defense Production Act of 1950, as amended. The Government's share of the project costs is repayable on a percentage-royalty basis from the net receipts of any ore produced by the operator from the property subject to the contract between the Government and the operator covering the project.

During the fiscal year ending June 30, 1953, DMEA continued to carry out the exploration program with a comparatively small staff and the cooperation of the Bureau of Mines and Geological Survey. The past year's operations has established the soundness of the program, as well as its success. Industry participation is widespread and includes individuals, partnerships, and corporate enterprises. The program is exemplified by the large number of small operators who are participating in projects.

In the period from the beginning of the program in mid-1951 to June 30, 1953, applications for Government aid in exploration have been received for projects located in 41 States and Alaska. During fiscal year 1953, requests for aid were received for 503 projects, bringing the total number of applications received as of June 30, 1953, to

1,914. At the beginning of the fiscal year, DMEA had executed 315 contracts with operators. The aggregate Government commitments for participation then stood at $9,403,629. In the subsequent 12 months, 202 new contracts were executed, bringing the total as of June 30, 1953, to 517, involving commitments of Government participation amounting to $15,204,434 since the inception of the program. Industry participation in contracts executed during the past 12 months amounted to $3,631,635, and since the beginning of the program, amounted to $9,967,149. These contracts include exploration projects in 31 States and Alaska, and involve a search for 25 different minerals.

Forty certifications of discoveries or developments of deposits of strategic and critical minerals and metals were issued during the past year. The total contract amounts of these 40 certified projects was $1,411,949, and on these propects the Government was committed to participate to the extent of $807,260, but only $636,781 was actually spent by the Government. Previous to June 30, 1952, 12 projects had been certified. Thus, the total number of projects certified by DMEA as of June 30, 1953, is 52, having total contract amounts of $1,628,075. The Government's participation in these projects was set at $951,060. Of this amount, the actual cost to the Government was only $744,807, due to work on several contracts being completed at a less cost than estimated. As of June 30, 1953, repayments to the Government by operators under DMEA contracts have amounted to $67,836.

The 52 certifications were for projects involving a search for deposits of antimony, beryl, fluorspar, mica, monazite, rutile, talc, sulfur, manganese, tungsten, uranium, copper, lead-zinc, and lead-zinc-copper. Eleven of the certified projects were in Colorado, 7 in North Carolina, 5 in Idaho, 4 each in Washington and South Dakota, 3 each in Montana and Wisconsin, 2 each in Arizona, Arkansas, and California, and 1 each in Florida, Georgia, Illinois, Iowa, Maine, Missouri, Nevada, Utah, and Wyoming. In addition to these 52 certified projects, 78 other projects had encountered ore showings which may eventually lead to their certification. Thirteen of the fifty-two certified projects had not been terminated as of June 30, 1953. On a conservative basis at prices in effect at the end of the fiscal year, the net recoverable value of the ores found on the 52 certified projects is estimated at $54 million. Estimates for the 78 other projects showing ore which have not been certified, indicate a substantial increase in this amount.

Eighty-five contracts, under which actual work was performed were terminated without certification of discovery or development during fiscal 1953. The estimated costs for these 85 terminated contracts originally totalled $1,952,100, with Government's participation set at $1,300,606; but actual cost to the Government was only $661,531. At the beginning of the fiscal year, 27 contracts had been terminated without certification. Thus, since the defense minerals exploration program was instituted, 112 contracts have been terminated without certification. These 112 contracts had estimated costs totalling $2,281,369. The Government's share in these costs was estimated at $1-533,275, of which only $757,052 was expended by the Government. Although 112 projects are considered as being unsuccessful, in that ore in commercial quantities was not found, valuable geological information was obtained.

Every application from an operator desiring to participate in this program requires an analysis and study by technical experts, and in the majority of cases, on-site examinations of the proposed projects by the DMEA field teams, composed of personnel of the Bureau of Mines and Geological Survey, even in those cases where the application is denied. As a further measure of the work performed by DMEA, in this connection, a total of 807 applications have been denied, 263 during the past year, and a total of 328 applications have been withdrawn, 125 during the past year.

The number of applications received during fiscal 1953 has continued at a high rate, averaging about 42 per month for the past 12 months, and 45 per month for the past 6 months. A steady decline in the number of applications for lead-zinc and lead-zinc-copper projects has occurred. This is primarily attributed to the continued low market prices for lead and zinc. However, this trend was offset somewhat by increases in the number of applications received for asbestos, mica, tungsten, and uranium projects. Interest in exploration for these minerals, as well as beryl, columbium-tantalum, manganese, and chrome is stimulated by Government purchase programs.

In fiscal 1953, the Contract and Audit Division of DMEA was strengthened by additions to its staff. Audits of projects were made at a rapid rate. As of June 30, 1953, a total of 229 audits of accounts covering 210 project accounts have been completed. The amount of Government disbursements on these 210 projects totals $3,668,824, or approximately 54 percent of the total DMEA disbursements made under the exploration program since its inception. Most of this audit work was performed during the past 12 months.

Obstacles to the exploration for asbestos and uranium were overcome in the past year. Clearance was gained for projects on Indian and State lands to permit DMEA to waive deficiencies in terms of some leases on these lands in order that exploration projects for asbestos and uranium could be consummated. The problem of uranium exploration on public land on which oil and gas leases had been issued was solved through conferences of officials of the Department of the Interior and the Atomic Energy Commission. This solution of the conflict between oil and gas leases and mining locations resulted in a definite increase in applications for DMEA assistance in exploring for critically needed uranium.

DMEA made two amendments to DMEA Order 1, during fiscal 1953. Amendment No. 1 provided for waiving of deficiencies in the operator's interest in the land subject to the contract if in the best interest of the Government and for fixing the repayment period of royalties on certified projects at more or less than 10 years. In compliance with the Office of Defense Mobilization directive of April 15, 1953, DMEA issued amendment No. 2 which eliminated 19 minerals from those eligible for exploration, thus restricting exploration assistance to specific minerals in short supply. This amendment also changed the provisions of DMEA Order 1 covering repayment by the operator. On June 1, 1953, ODM authorized DMEA to process all applications on record as of May 15, 1953, for those minerals which were removed from the eligibility list pursuant to its previous directive. As of May 15, 1953, there were some 80 applications in this group. This number was reduced to 65 by June 30, 1953.

Inasmuch as exploration is a comparatively long range operation, substantial results cannot be expected at this time. Although some successful projects are producing ore, a number of other successful projects have closed down until more favorable prices exist than at present for the minerals found. In the case of others where currently uneconomic mineral deposits have been found, in a search for higher grade minerals, production will probably be made only in times of emergency. However, these deposits will constitute a reserve of strategic minerals that can be made available in time of need.

The program is well accepted by industry, and the participation by mine operators in the search for new sources of ore is a significant contribution to the Nation's progress toward defense mobilization readiness. The fine cooperation of other Government agencies has aided materially in carrying out the program. Development of new techniques in exploration, development, and mining; research in ore beneficiation and metallurgy; and new and increasing use of materials, as well as Government purchase programs, tend to stimulate interest in the search for mineral resources and to maintain a high rate of exploration activity.

DEFENSE SOLID FUELS ADMINISTRATION

W. F. Hahman, Administrator

During the fiscal year 1953, the Defense Solid Fuels Administration pressed forward on its vital programs to aid the solid-fuels industries achieve the output of coal, coke, and coal chemicals required to meet the needs of the defense-mobilization program. This period was marked by an increase in the expansion goal for the production of coke for blast-furnace operations; a corresponding increase in the capacity to produce metallurgical coal; the establishment of an expansion goal for the production of coal in the Territory of Alaska; and a period of suspended coal production during which the allocation powers of the Administration were exercised to avoid a critical fuel shortage throughout the Nation. Progress was made toward meeting the expansion goals for coke and metallurgical coal, as well as increased coal production in Alaska, although on July 1, 1953, a substantial portion of the construction required to meet the coke expansion goal was either under construction or still in the planning stage and increased coal production in Alaska was still required.

COAL-MINE MAINTENANCE AND CONSTRUCTION

During the fiscal year DSFA authorized and distributed controlled materials for 26 coal-mine-construction projects costing approximately $24,700,000 and provided priority assistance to producers for major capital additions in the amount of $2,482,000. The division of the construction projects among the various States and Territories follows: Alabama, 2 projects, $4,105,146; Alaska, 1 project, $285,160; Illinois, 1 project, $1,416,467; Kentucky, 1 project, $70,000; North Dakota, 1 project, $520,000; Ohio, 3 projects, $3,349,246; Pennsylvania, 6 projects, $5,053,009; Utah, 1 project, $85,000; Virginia, 2 projects, $2,315,001; West Virginia, 8 projects, $7,475,961.

All needs of coal producers for materials for maintenance, repair, and operating supplies continued to be met under the self-rating system of priorities which had proved so effective in fiscal 1952 and materials for new construction were also provided in adequate quantities. As increased supplies of controlled materials became available in the latter part of the year, controls were gradually relaxed and NPA Order M–87, which provided the authority for the assistance needed by the solid-fuels industries to obtain their needs for materials for maintenance, repair, and operation, was revoked at the end of the year, as was Solid Fuels Order 1 which had been designed to implement and facilitate this portion of the work of the Administration.

COAL PRODUCTION—TERRITORY OF ALASKA

The rising military requirements for coal in the Territory of Alaska were recognized as essential to the defense-mobilization program and an expansion goal providing for an annual capacity of 950,000 tons was established by the Defense Production Administration in July 1952. This represented an increase of 400,000 tons over the estimated annual rate of production at that time. During the fiscal year, DSFA was instrumental in retaining in production the largest producing company in the Territory, when, through a technicality, it was threatened with the forfeiture of its lease, and recommended financial assistance for two other producers. At the end of the fiscal year, plans were being made by the Department to send qualified personnel to the Territory of Alaska to make a thorough study of the coal situation.

COKE-OVEN-CONSTRUCTION PROGRAM

During fiscal year 1953 the expansion goal for oven coke for blast-furnace operation was increased an additional 1,800,000 tons, bringing the revised goal to 85,800,000 tons by January 1, 1955, and raising the metallurgical coal requirements an additional 2,500,000 tons. During the year, coke ovens were put into operation with an annual capacity of 6,006,600 tons. The capacity lost through the dismantling of overage ovens, however, totaled 1,637,200 tons, leaving a net gain in capacity of 4,369,400 tons.

During the year DSFA authorized and distributed controlled materials for 26 coke-oven projects costing approximately $101 million. Special priority assistance for component parts, costing $418,400, was provided in 42 instances.

INDUSTRY FINANCE

Through June 30, 1953, certificates of necessity for rapid tax amortization of essential coal and coke facilities were certified for 33 projects costing about $167 million. The 14 coal projects, costing about $17 million will provide, when completed, a metallurgical coal capacity of about 2,300,000 tons. The 19 coke projects, costing about $150 million, will have an annual capacity of about 3,200,000 tons. Applications totaling $143 million were denied. At the end of the fiscal year, 4 applications for tax amortization, totaling $18,500,000, were being processed.

Of 14 applications processed during the year for loans aggregating $5,400,000, 2 were approved, 11 were denied, and 1 was withdrawn. The approved loans provided $1,257,000 for the development of coal mines in the Fairbanks area of Alaska.

EMERGENCY COAL-DISTRIBUTION PROGRAM

The importance of the powers delegated to DSFA with respect to coal distribution was graphically demonstrated during the coal strike in October 1952, when, by utilizing these powers promptly, the impact of the strike was minimized and the needs of essential consumers were met.

Solid Fuels Order 4, prohibiting coal shipments from mines affected by a work stoppage, was issued on October 19, following the disapproval of the terms of the new soft-coal wage agreement by the Wage Stabilization Board. The purpose of the order was to provide an emergency supply of fuel which could be distributed during a strike period to consumers in urgent need.

During the work stoppage, DSFA directed shipments involving about 40,000 tons of coal to consumers who certified that they had only a few days' supply on hand. These directed shipments included 9,000 tons shipped to users classed as essential to public health and welfare; 8,000 tons to defense installations; 7,500 tons to railroads; and 6,000 tons to industrial consumers. Food-processing plants received 2,300 tons; schools 1,000 tons; and miscellaneous consumers about 5,700 tons. Large quantities were also supplied to retail dealers whose shipments were exempted from the freeze by the terms of the order. Nine area distribution managers were appointed to serve during the strike period and assisted in handling the work involved in the emergency distribution program.

PETROLEUM ADMINISTRATION FOR DEFENSE

Joseph A. LaFortune, Deputy Administrator[1]

Fiscal 1953 proved a year of contrasts for the Petroleum Administration for Defense. It began in a time of marked materials shortages. It ended with a situation that permitted relatively rapid loosening of controls.

On July 1, 1952, effects of the work stoppages in the steel industry were pronounced in the oil and gas industries. Necessary expansion of refineries, storage facilities, and pipelines to meet defense needs was seriously impeded. Drilling of wells was particularly affected, for operators in many cases had been working on reduced inventories.

By the first of August 1952, the future looked dismal for the oil and gas industries and for PAD, which had defense responsibility for them.

Yet these industries, aided by PAD, displayed remarkable resilience. By the end of calendar 1952 it was obvious that material supplies would be ample and supplies of petroleum and gas would meet all essential needs.

The Petroleum Administration for Defense promptly began a dismantling process, reducing the scope of its staff as the scope of its problems diminished. By the end of the fiscal year the organization, which on July 1, 1952, had numbered 328 persons, had only 92 on its staff.

There had been 20 divisions of PAD as of June 30, 1952. As of June 30, 1953, there were 19—10 operating divisions (many with skeleton staffs) concerned with domestic petroleum operations, foreign petroleum operations, and gas, and 9 general service divisions and offices.

Over the year many other agencies had helped mobilize the oil and gas industries to meet what still proved, despite some lessening of intensity, a continuing challenge. These included an interagency

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[1] Mr. LaFortune succeeded J. Ed Warren, second Deputy Administrator of the agency, on July 1, 1953.

Foreign Petroleum Committee, the Oil and Gas Division of the Department of the Interior, the Interstate Oil Compact Commission, the various State regulatory bodies, and others.

During fiscal 1953 PAD continued to make constant use of the services of the National Petroleum Council and the Gas Industry Advisory Council. It also relied heavily on the work of the Military Fuels General Advisory Committee and a Military Fuels Technical Advisory Committee, although most of the work of these groups was classified for security reasons.

What had been said at the end of fiscal 1952 could be said again for this fiscal year: Despite strains and occasional dislocations the minimum requirements of the United States and the other free nations for petroleum and its products were met in full and on time.

But even more, this could be said: A year that started ominously ended in an atmosphere that justified cautious optimism about the state of petroleum preparedness in the defense period.

Aviation-gasoline supplies continued to be a pressing, immediate problem. The long-range problem of building an ample reserve of productive capacity in all branches of the industry for use in case of all-out war persisted. Still most of the recurring crises that had confronted the agency had been met and weathered.

Once the special problems of the steel strike had been solved, PAD's history became one of loosening controls over the industry as quickly as the situation permitted.

STEEL-STRIKE ACTION

On June 23, 1952, PAD had stopped authorizing purchases from the emergency field stocks of casing and tubing reserved largely for smaller operators' use in wildcat drilling. By July 15 the drop in wildcatting essential to the discovery of new reserves had become so alarming that action was necessary. On that date the National Production Authority at PAD's request directed the Pittsburgh Steel Co., then in operation, to fill within the next 30 days, orders for approximately 6,400 tons of casing and tubing. On the following day NPA directed that no deliveries of casing and tubing could be made from any field stocks except on emergency ratings. The two actions together permitted PAD to release some 500 applications for emergency-stock purchases that had been approved but previously held within the agency.

Despite the temporary relief, and despite the end of the steel strike, on August 14, PAD announced it was holding up some 150 approved applications for emergency-stock purchases because of the pipe shortage.

Not until August 21 could the restrictions on deliveries from the regular field stocks of pipe be lifted and the approval for purchases from emergency stock be put back on a normal basis.

Meanwhile, on July 24, the day before the strike ended, PAD said it would issue no fourth-quarter authorizations for purchases of tubular goods from regular mill production.

It was the first quarter of calendar 1953 before materials allocations—then the major part of PAD's work—could be restored to normal.

PAD ORDER NO. 1

The progressive relaxation of PAD Order No. 1 on the use of tetraethyl lead (TEL) in automotive gasoline was completed October 1, 1952, with revocation of the order. Issued in February 1951, to help in building a needed military reserve of TEL, the order at first placed strict limits on the amounts of TEL that could be used in such gasoline. As the supply increased, the agency on February 15, 1952, permitted a greater use. Then on April 1 all limitations were dropped, but refiners were still required to file reports on the amounts they were using. The revocation ended even this requirement.

PAD ORDER NO. 2

Constant expansion of natural-gas transmission lines and major increases in underground storage facilities for natural gas made it apparent by the summer of 1952 that the threat of gas shortages was easing. As a result PAD on August 22, 1952, liberalized its PAD Order No. 2. This order, effective August 22, 1951, was issued to slow down expansion of natural-gas uses in areas where shortages threatened because of a lack of adequate pipeline facilities.

The winter of 1952–53 fortunately proved to be mild. There were practically no reports of gas shortages, even temporary ones. Consequently on March 1, 1953, the agency rescinded Order No. 2 in its entirety.

PAD INSTRUCTION NO. 2

During the May 1952 refinery strikes, when everyone feared it might become necessary to allocate petroleum products in some localities, the agency issued PAD Instruction No. 2, which had 2 parts: One, sections 3 and 4, provided specifically for the appointment of local committees to help PAD assess supply situations during the strike.

The rest of the document prescribed the framework of any such committees that might be necessary in any future shortage situations.

Sections 3 and 4 were never used by PAD because it begun to appear that the petroleum strikes would soon end. On July 9 these 2 sections were revoked.

The rest of the instruction was kept in effect until December 12, 1951, so it might be used quickly if new need should arise. By December, though, it was clear there was no probability of a need in the near future. The entire instruction was canceled.

FOREIGN

In the anual report of the Secretary of the Interior for 1952 it was noted (p. 476):

> The end of the year found free-world petroleum supplies and demands in rough balance, though shortages still threatened in aviation gasoline, some heating oils, and residual fuel oil.

So great had been the improvement since the Iranian shutdown of June 1951 threw the free world into petroleum imbalance that on July 9 plan of action No. 1 under the voluntary agreement for free-world petroleum supplies was ended. This was a plan specifically tailored to meet the problems created by the Iranian crisis.

From July 26, 1951, until July 9, 1953, the 19 American companies participating in it had, with the approval of PAD, completed 25 schedules of transactions involving 45,987,000 barrels of petroleum—19,429,000 barrels of crude oil and 26,558,000 barrels of products.

Although the plan of action was ended, the voluntary agreement, dated June 25, 1951, was kept in effect. Only through the Foreign Petroleum Supply Committee functioning under that agreement, PAD officials believed, could the Government in all its branches get the current information on petroleum supply and demand it needed to assess the foreign situation properly.

On January 16, 1953, the Attorney General withdrew the previous Department of Justice approval of the foreign-oil voluntary agreement. April 30, 1953, the agreement was formally ended by a withdrawal of the original request for participation by American companies operating abroad.

Over the period from January efforts to resume the agreement were pushed, however, in view of Department of Defense views that the information available through the FPSC was essential to national security. Finally, on May 1, 1953, a new agreement was issued. There were no substantial changes from the original, although this time only 14 American companies were invited to and did join in the agreement.

Supplies of aviation gasoline continued short worldwide and the FPSC had to maintain a close watch on exports of this product.

As during 1952, PAD's Assistant Deputy Administrator in Charge of Foreign Petroleum Operations served as the United States representative on the Petroleum Planning Committee of the North Atlantic Treaty Organization and special consultant to the United States Ambassador at Large to NATO. The head of PAD's Program Division has served as Chairman of the Special Working Committee of the NATO Petroleum Planning Committee.

GENERAL

From June 11, 1951, through June 30, 1953, PAD received 7,025 original applications for permission to complete or construct oil or gas projects. The agency approved 6,349 of these original cases for facilities valued—after amendments—at $5,785,254,497. Applications for facilities valued at $1,076,314,740 were denied, canceled, or returned without action.

From September 23, 1950, to the end of June 1953, the agency received 1,841 applications for accelerated tax amortization on oil and gas projects. It approved 1,431 of these in part or whole, recommending a rapid writeoff on an average 50 percent of the total $3,849,271,000 cost.

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1954

1954

ANNUAL REPORT

FOR THE FISCAL YEAR ENDED JUNE 30

SECRETARY OF THE INTERIOR

DOUGLAS McKAY

Resources for Tomorrow

March 3, 18

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ANNUAL REPORT
FOR THE FISCAL YEAR ENDED JUNE 30

SECRETARY OF THE
INTERIOR
DOUGLAS McKAY

Resources for Tomorrow

DEPARTMENT OF THE INTERIOR
March 3, 1849

UNITED STATES
DEPARTMENT OF THE INTERIOR
Douglas McKay, *Secretary*

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March 3, 1849

THE SECRETARY OF THE INTERIOR
WASHINGTON

My Dear Mr. President: I transmit herewith the Annual Report of the Department of the Interior for the fiscal year which ended June 30, 1954.

In addition to reviewing the principal activities of the Department's various bureaus and offices, this report also provides a brief evaluation of these activities in terms of their significance in helping to meet future resource requirements. While the report indicates that substantial progress is being made, many natural resource problems continue to require special attention. We shall continue to work earnestly and creatively to insure that the resource needs of tomorrow as well as those of today are fully and efficiently met.

Sincerely yours,

Douglas McKay

Secretary of the Interior.

The President,
The White House,
Washington, D. C.

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PART I

RESOURCES FOR TOMORROW

Resources for Tomorrow

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TO THE Department of the Interior, the Nation has given the primary Federal responsibility for the conservation and development of its natural resources.

This is a crucially important task. The future welfare of our people may well depend on how wisely we conserve, how soundly we develop our basic resources of water, land, minerals, and energy sources. When our resource problems are considered on a truly long-term basis, moreover, our very survival as a civilization may be said to hinge upon the future adequacy of our natural resources.

Inherent in the concept of conservation is concern for the future. Our resources are not inexhaustible. As our Nation continues to grow the demands upon these resources will continue to expand at a tremendous rate.

Some of our resources—such as minerals, oil, gas, and coal—are nonrenewable. Once used they are gone forever. At the same time we should remember that only by using them can we continue to expand our economy.

Other resources such as land can lose their productivity unless we practice sound conservation. Still others, like our water resources, are renewable.

In looking ahead to the needs of the future we must give the needed emphasis to development of new sources of wealth as well as to conservation of what we have. The concept of conservation in the sense of hoarding or locking up our resources, in fact, is a negative one. If pursued to its logical extremes, it would mean a halt in our progressive growth as a Nation and as a prosperous people.

Actually, one of the most vital aspects of our modern history has been the finding and developing of new sources of wealth. Hand in hand with conservation must go a vigorous effort to develop new materials, new sources of energy, to replace those which face ultimate exhaustion.

Future Resource Problems

With regard to all of our basic resources, indeed, it is clear that the future will bring difficult and complex problems.

As our needs for fertile acreage grow, we must carry out necessary programs for reclamation of arid and semiarid lands, using both our water and our land in the most efficient manner.

We must develop efficient, low-cost methods of processing secondary mineral deposits and reclaiming wasted sources, as well as find new materials and substitutes to fill the gap left as our better mineral sources are exhausted.

As our demands for energy continue to increase, we must assure the wisest use of our exhaustible supplies of fossil fuels such as oil, gas, and coal. Hydroelectric developments should assume their proper role, although the hydroelectric potential is at best only a small proportion of the total energy requirements. Before too long, atomic energy may be expected to contribute to our supply. And, ultimately, we may turn to the energy of the sun and the tides as a last, long-term source.

Many of these problems lie far in the future. The United States more than any Nation in the world has been blessed with a bounteous supply of nearly all the resources required to continue to increase the usable wealth of its people. Yet even today we can see already the value of conservation practices—followed during recent past decades—which have preserved valuable resources for our present use.

Long-Term Programs Needed

When the ever-accelerating pace of our consumption of natural resources is considered, in fact, it is more than ever apparent that we must begin preparing today for problems that, while still years in the future, can be met successfully only if we look ahead and develop now the long-term programs that are required.

It is not an easy task to prepare to meet problems that may not become critical until the day when our children or our children's children come of age. We have immediate concerns that absorb our attention, decisions that must be made on the basis of our present inadequate knowledge of the full scope of tomorrow's needs.

Nevertheless, to the maximum extent possible, all of the Interior Department's many and varied activities have been directed to contributing to the conservation and development of the Nation's resources so that they will serve the needs of future generations.

A Mutual Undertaking

The primary role in the development of the Nation's resources has always been assumed by private individuals rather than by the Government. That has been the historic American way. The role of the Department of the Interior is one of providing guidance and leadership through research and the effective accomplishment of its specific responsibilities assigned by Congress. The task ahead is so great that it can be approached only as a mutual undertaking involving the cooperative teamwork of the Federal, State and local agencies and—most basic of all—the initiative of individual citizens.

Evaluation of Present Activities

This report attempts to provide a brief, practical evaluation of the Department's major activities indicating how they are being directed to serve future needs and how they are being shaped in response to changing resource demands.

Many questions admittedly must remain unanswered, except to indicate the line of approach which is presently being pursued. In other cases, even fundamental questions may remain unasked because the problems are still unanticipated or only vaguely sensed. No one claims to have all the answers. We do claim merely that we are making substantial progress toward meeting those needs of tomorrow that we know or can visualize, and that our nation and industrial society are well prepared, from a resources standpoint, to meet the future.

WATER AND POWER

Life itself is impossible without water, and it is fortunate that water is a resource that is constantly renewed.

On how effectively we control the water which falls on our hills and plains, however, depends a host of key resource responsibilities. Untamed and unharnessed, our water can be a destructive enemy. It may erode away our fertile acreage, and bring floods to destroy our cities.

When intelligently controlled, however, water can bring productive wealth in many ways.

The angry spring floods can be stored in vast reservoirs for release in later periods of shortage to bring fertility to otherwise arid lands. The mighty surge of our great rivers can be harnessed to provide electric power for our homes and industries.

The more quiescent flow of other streams and rivers can be controlled and spread so that the precious water is stored underground for later withdrawal.

Origins of Reclamation Policy

For more than a century, continuing development of our water resources has been recognized as essential to national economic advancement, particularly in the arid and semiarid Western States. This policy had its inception with the early Spanish explorers who followed the trail blazed by the aboriginal Indian tribes in introducing extensive irrigation into the Southwest, and with the sagacious Mormon pioneers who in 1846 dug the first irrigation ditch bringing water to land in what was to become Salt Lake City, Utah.

Fifty-six years later, in 1902, President Theodore Roosevelt signed the Federal Reclamation Act, bringing into being the first major partnership in the development and beneficial use of this natural resource in the arid and semiarid regions of the United States.

It should be noted that when the Reclamation Act was passed the opportunities for homesteading were rapidly diminishing. Vast areas of productive land, such as that settled by the early pioneers, were no longer available. At the same time, with the increase of our population the need for an increased food supply was growing rapidly. The Reclamation Act, by opening up new land for agricultural development, therefore, was an important phase in the history of America's effort to provide resources for tomorrow.

It is significant that administration of the Federal reclamation law was vested in the Department of the Interior, where it remains today, thus affording a foundation for continuity in technical knowledge and practical experience in the planning, construction, and operation of reclamation projects containing such engineering features as the world's largest and highest dams, water-distributing canals, and hydroelectric powerplants.

Highlights of Progress

Success of the Federal reclamation program is reflected in the service rendered in the 17 Western States. New or supplemental water has been supplied for more than 7 million acres of irrigable land on which settlers have established 125,000 farms. Another 1½ million persons live in nearby towns and villages which depend economically in a large measure upon the program. This land supplied with water from Bureau constructed works is about one-fourth the total irrigated area in the Western States. The other three-fourths has been irrigated by private initiative, acting through State and local agencies. The Bureau's activities aid in the more difficult and complex developments. In addition to supplying irrigation water, Bureau of Reclamation-constructed works provide municipal and industrial water service to over 2 million people.

Construction completed during the year added about 2 million acre-feet of storage capacity in new Bureau of Reclamation reservoirs, 700 miles of canals, pipelines, and laterals, almost 300,000 kilowatts of hydroelectric generating capacity, and 100 miles of major electric transmission lines.

The year was highlighted by completion of Canyon Ferry Dam, a large concrete dam on the Missouri River in Montana, and by the placing in service of its 50,000-kilowatt powerplant; by completion of Jamestown Dam, an earth dam in North Dakota, nearly a year ahead of schedule, the "holing through" of the 4½ mile long Eklutna Tunnel in Alaska, and the construction of irrigation facilities to serve about 55,000 acres of land on the Columbia Basin Project in Washington.

The 1955 construction program will provide for the completion of irrigation facilities to supply new and supplemental water supplies to an additional 290,000 acres of land and for an increased hydrogenerating capacity of 241,500 kilowatts.

Future Reclamation Activities

Looking at the future economic needs of the Nation, nearly 5 million acres of irrigated land can be added to the agricultural potentiality of the Western States, and nearly 700,000 kilowatts of hydroelectric generating capacity can be installed in plants on Bureau of Reclamation projects already authorized to be constructed by Congress.

In addition, the blueprint for continued development in the West, which will have its effect throughout the Nation, calls for the recommendation to Congress of legislation, cosponsored by local water resource interests and the Bureau of Reclamation, authorizing construction of such major undertakings, as the Colorado River Storage project, the Fryingpan-Arkansas project, and the Washita River Basin project.

The latter project would provide water for municipal and industrial use and for irrigation of 25,700 acres of land in Oklahoma; the Colorado River Storage plan would provide reservoir space for 47,355,000 acre-feet of water for irrigation and other purposes including the generation of 1,592,000 kilowatts in a five-State area, while the Fryingpan-Arkansas project would furnish water for 322,000 acres of land and the generation of 500,000 kilowatts of hydroelectric power in the eastern Colorado region.

The Department is giving its vigorous support to these projects which are essential to the development of important areas of the West. Other projects are under current investigation and in keeping with its affirmative reclamation program the Department intends to pursue actively the investigation of every desirable project, as funds are made available by Congress. Needed projects found to be feasible from an engineering standpoint and falling within the guideposts established by Congress will be firmly supported.

The record of reclamation activities belies any suggestion that this essential program has been permitted to lag. The Upper Colorado River Storage Project alone is the most comprehensive and far-reaching undertaking for water resource development proposed in recent years. All in all, the reclamation program is moving ahead at a steady pace, with construction work, appropriations, and recommendations for the authorization of new projects all showing progress in fiscal 1954.

America is a home-building Nation. That trait is dramatically typified in the demand, particularly from veterans of service in the Armed Forces, for farm units made available by irrigation under the Reclamation program. Since the end of World War II a total of almost 2,000 farm units aggregating about 153,000 acres of land were made available for acquisition on 13 Bureau projects. Applications for farm units totalled almost 87,000, mostly from veterans.

Agricultural Production

The 1953 harvest of crops in the service area of Federal reclamation projects was valued at $785,939,868. This was the eighth consecutive year with crop values in excess of one-half billion dollars. It brought the cumulative value of the products produced by all reclamation projects from 1906 through 1953 to more than $9.7 billion.

Tonnagewise, the 1953 harvest was the highest on record, 9 percent greater than the previous year and 80 percent larger than the harvest of ten years ago. In terms of acres, the most significant crops were hay and forage with 44.6 percent of the irrigated lands producing these crops.

The benefits accruing to the Nation through reclamation development are measured in terms of families served, crop production and value, livestock raised, increased population on and adjacent to projects, and in a wide variety of other ways.

These benefits filter to every State and every segment of society. They provide through this process additional economic stability to the Nation.

Partnership in Reclamation

Emphasis on these achievements of the Federal reclamation program, however, must not lead us to ignore the major role played by private citizens, local communities, and State governments in the Western States. While in many instances they have been partners with the Federal Government in supplying irrigation water, in innumerable other cases local interests without any financial aid or assistance from the Federal Government have with their own resources transformed parched sagebrush desert into more than 19 million acres of irrigated land, which contributed substantial benefits to the economy of the Nation.

The success of America's water resources conservation program depends upon the extent these local interests share in the responsibilities and opportunities for providing the Nation's resources for tomorrow. The Federal Government, and particularly the Department of the Interior, stands ready to contribute its full share to any partnership. The technical know-how amassed under the Federal reclamation program is at the service of the people of the Western States.

Guidance toward the goal of maximum beneficial use of the water resources is being formulated through the preparation of a national water policy, and through legislation which will be presented to Congress to permit effective cooperation between the Federal Government and local interests in the financing, planning, and development of water resources projects.

Power Needs of Northwest

The Pacific Northwest is characterized by an abundance of water resources and paucity of other sources of energy. It lacks known deposits of petroleum or natural gas and has relatively small deposits of high-grade coal. But the Columbia River and its tributaries, gathering the flow of numerous streams originating in the snow-capped Rocky Mountains and Cascade range, contain the largest concentration of water power found in any drainage basin in the United States.

Only about 15 percent of the Columbia's 34 million kilowatt potential has been harnessed by dams built by the Federal Government, privately owned utilities, and public agencies. The vast bulk of the Columbia River system's energy potential and some of the best dam sites still remain to be used.

Total requirements, exclusive of new electro-process industries, are expected to jump from 29.5 billion kilowatt-hours in 1953 to 58 billion kilowatt-hours in 1963, or about 7 percent annually.

The economic development of the Pacific Northwest has been phenomenal in the past 15 years, but the future offers even greater promise. Power is a major key to the region's future prosperity, and the control of falling water to generate low-cost electricity must be the basis for the bulk of the additional energy supply.

The Western Group of the Northwest Power pool, whose service area includes Washington, most of Oregon, northern Idaho and parts of western Montana, presently has an installed capacity of 5,100,000 kilowatts. Of this total, 3,100,000 are in the 12 multipurpose projects of the Federal system. Non-Federal hydroelectric capacity in the region totals about 2 million kilowatts, about two-thirds of which is in private ownership and one-third in local public ownership. An additional 3,100,000 kilowatts are under construction by the Federal Government and 115,000 kilowatts by non-Federal utilities. Thus, when all the projects now scheduled are completed, 6 or 7 years hence, the region will have more than 8,300,000 kilowatts of installed capacity.

Under the new power program of the Administration the Federal Government will undertake large multipurpose projects which are beyond the means of local public or private enterprise. Such a project is Libby Dam on the Kootenai River in northwestern Montana, endorsed by the Secretary of the Interior and the Secretary of the Army for immediate construction. One of the key upstream storage dams in the proposed control plan for the Columbia River, Libby would eventually add 880,000 kilowatts—including downstream benefits—to the Pacific Northwest power supply. This project offers complications because it backs up water into Canada and has international ramifications. There are other similar projects under consideration by State agencies and private organizations.

Partnership Necessary

In order to meet the needs of the region for power, however, it is clear that substantial non-Federal construction is required. The construction job to be undertaken is too tremendous and costly for the Federal Government to carry the burden alone. Under the new power policy of the Administration local interests are being encouraged to play their proper part. This policy, keyed to the need for developing for tomorrow the Northwest's waterpower potential, is meeting with an affirmative response. Non-Federal utilities now have some 35 hydroelectric projects and additions to existing projects with a total of over 5 million kilowatts proposed for development in the Northwest. Many of these involve partnership development, with the private companies or local public agencies constructing the power facilities and the Federal Government financing the nonreimburseable features.

This positive approach, a departure from the negative view that only the Federal Government is equipped to do the job, recognizes that the cooperation of all groups is essential if the region is to be provided with the electric power it needs. The realism and effectiveness of this partnership program evolved by the Eisenhower Administration was recognized by the 83d Congress with the approval of legislation such as that authorizing public agencies in the State of

Washington to build the mammoth Priest Rapids dam with the Federal Government responsible for flood control and navigation facilities.

It is clear that local people are alert to the region's power needs and are aggressively working to solve the problem. It appears likely that much of the needed capital will be raised through cooperative effort and that several hydroelectric plants now under consideration will move forward and reach the construction stage in the next few years. Certainly the power problem offers a tremendous challenge to the region, and that challenge is being met.

Power in the Southeast

In the Southeast, large volumes of water flow in abundance from the mountainous section of that area down to the Atlantic Ocean and the Gulf of Mexico. This water has a potential of nearly 13 million kilowatts annually which can best be used for peaking purposes when properly integrated with fuel burning systems. The firm and dependable energy from these projects, because of the irregularity of stream flow, is very much less than their capacity when used only a few hours a day for peaking purposes, and many of them have little if any dependable capacity if used on a 24-hour-a-day basis.

The Department's Southeastern Power Administration is responsible for the marketing of 1 million kilowatts of developed capacity produced at 7 projects located on 4 Southeastern rivers. Now under construction by the Corps of Engineers are four additional projects which will add another quarter of a million kilowatts of capacity.

Power in the Southwest

In the Southwest, we are blessed with four great river systems: the Arkansas—fourth largest in the United States—the White, the Red, and the Gulf Coast river system.

A start has been made toward controlling the floods and developing the hydroelectric potential. Several large reservoirs have been constructed and planning is underway for others to generate hydroelectric power, regulate stream flow, provide a measure of protection to the areas downstream and provide storage for other priority uses, such as municipal and industrial water supply, pollution abatement, irrigation, and navigation.

In the Southwest, there are 10 existing major hydroelectric Federal and State projects with an installed capacity of 578,400 kilowatts, and an average annual generation of 1,925,100,000 kilowatt-hours. Two projects are under construction which will have an installed capacity of 175,000 kilowatts and an average annual generation of 616,000,000 kilowatt-hours.

Power Marketing in Southwest

As the marketing agency of the Department of the Interior in the eastern half of this region, the Southwestern Power Administration is responsible for the sale at wholesale of such hydroelectric power.

The degree and timing of the development of projects to furnish a portion of the electric power and the domestic and industrial water supply which will be needed in the expanding development of resources in the Southwest will have a great bearing on the conservation and proper utilization of all the resources in the area.

Water Investigations

As the Nation has continued to grow, its needs for water in every part have grown, sometimes in geometrical proportion to the population growth. Even in parts of the Nation outside the arid and semiarid regions, the problems of water supply have become far more pressing. It may be anticipated that in some areas in the future policies may need to be adopted to assure the best use of such water as is available.

It is the business of the Geological Survey to conduct the search for more and more water. Water circulates endlessly through the hydrologic cycle, but there are limits to its development for use by man. The Survey conducts the necessary investigations to determine the quantities of water available, its usefulness, and the extent to which it can be developed without depleting the supply or impairing the quality.

Demands in many areas have caused a substantial increase in the use of underground supplies. Investigations are being made by the Survey in order to determine the extent of this resource. With the basic facts thus provided, the Nation can assure proper development and use without harmful depletion.

In certain areas of the United States existing sources of water are inadequate. In some places the supplies of fresh ground water and surface water are limited. In other areas increasing pollution by reuse of the water is resulting in sufficient deterioration of water quality to prevent any use. Current investigations include the study of changes in the chemical and physical characteristics of water in order to forestall aggravated conditions. Studies of trends of the mineral content of western streams, for example, are necessary for continued operation of irrigation projects.

With development of the country, its smaller streams become increasingly important as sources of supply, but their reliability or suitability can be gauged only if there is adequate information on their flow patterns. The Geological Survey attempts to obtain such data.

Desalting Saline Waters

In some areas where fresh water is extremely scarce a solution may be provided through development of a practical low-cost means of desalting sea water, or other saline water. The Department is now carrying on a research program aimed at producing water by this process which will be suitable for municipal, industrial, agricultural, and other uses.

Progress is being made. We are as yet a long way from any mass production process which would provide desalted water for industrial or agricultural uses on an economically feasible basis. It is possible, nevertheless, that domestic supplies of some coastal cities may be materially augmented by desalted sea water within the next few years.

If we succeed in achieving practical success in this program, we would have the promise of working a tremendous revolution for the betterment of mankind everywhere. When the millions of acres of parched land which could be made fertile by these methods are considered, the changes which could be wrought throughout the world defy the imagination. This program truly represents, therefore, one of the most important facets of the Department's efforts to develop new resources for tomorrow.

MINERAL AND FUEL RESOURCES

Minerals and fossil fuels differ from some other natural resources in that once used they cannot be replaced. Many deposits not now known undoubtedly will be discovered, and ways undoubtedly will be found to utilize many already known but not now of commercial grade. Nevertheless, our total resources, as distinguished from our known reserves, are fixed in quantity. We cannot add to them, but can only subtract.

Despite their irreplacable nature and their limited volume, minerals and fossil fuels are fundamental to our mechanical and industrial civilization. Indeed any civilization at all would be impossible without minerals, especially the metals. Man learned to fabricate implements and weapons of bronze—and, in the opinion of at least some authorities, of iron as well—before he learned to keep written records. If the supply of mineral raw materials and fossil fuels should be cut off, our whole industrial and economic machine would quickly grind to a halt. In fact the progress that has characterized the history of this country can continue only so long as these commodities continue to be available to us in constantly increasing volume.

In facing the challenge presented by the need for an ever-growing supply of mineral raw materials and fuels in the face of the inevitible depletion of our reserves, we can take heart from the experience of the past. When mineral deposits discovered in the early days of the Nation became exhausted, we found new ones. When it became clear that our forests would not provide enough charcoal to fuel our growing iron and steel industry, we turned first to anthracite and then to coke. When we ran short of whale oil and oil distilled from coal for illumination, we discovered that petroleum, formerly used chiefly as medicine, could light our lamps, and a great new industry was born. When an invention demanded better materials than were available at the time, we learned how to produce them. Conversely, when we learned to make new materials, we discovered hitherto unsuspected ways of using them.

Such developments throughout our history have followed a well-defined pattern. First scientists in their laboratories have advanced chemical or physical knowledge, sometimes intentionally but often apparently by accident. From their experiments, new substances have been developed as laboratory curiosities. Next, engineers have found ways of producing such substances economically and of incorporating them in designs. Finally, business enterprises have seized upon the results of such advances and translated them into end products.

Through the cooperation of scientist, engineer, and businessman we have developed new metals and fuels, sometimes from earlier wastes. For instance, in the early days of the oil industry gasoline was considered a dangerous waste material that had to be disposed of carefully by makers of kerosene; with the coming of the internal combustion engine this formerly discarded substance became one of the industry's most valuable products. We also have learned to utilize lower and lower grade ores; for example, most of the world's copper comes from material that would have been regarded as waste rock a few generations ago.

Formation of Cabinet Committee

In meeting the problem of supplying our needs for minerals, the Department plays a major part. Twice during the past 15 years the United States has been drawn into international conflicts, and each time the supply situation with respect to strategic metals and minerals has been critical. Even in peacetime, rapidly mounting demands for mineral raw materials have continued to place growing pressure upon our resource base.

In view of these facts, the President on October 26, 1953, established a Cabinet Committee on Minerals Policy to study problems relating to the production and utilization of metals and minerals and to make recommendations for national policies in this field. Membership on this Committee included the Secretaries of the Interior, State, and Commerce, and the Director of the Office of Defense Mobilization, with the Secretary of the Interior serving as Chairman. The Secretary of the Treasury and the Director of the Bureau of the Budget also participated in advisory capacities.

The Cabinet Committee during March 1954 presented an interim report containing a number of basic proposals. A key recommendation was for the establishment of a new, long-term stockpiling program. This plan, which was approved by the President and put in effect on March 26, 1954, calls for further acquisitions of 35 to 40 metals and minerals with the objective of virtually eliminating the risk that strategic and critical metals and minerals would become a bottleneck in time of emergency.

In appointing the Cabinet Committee, the President indicated that depressed conditions in numerous mining districts, largely the result of post-Korea adjustment, were of grave national concern. He asked that every effort be made to find an equitable solution to this problem, since strong and prosperous mineral industries form a primary component of a sound mobilization base. Consequently, the Committee indicated that purchases for the long-term stockpile were to be made, wherever possible, from domestic producers, and ordinarily at times when the Government decides that purchases will help to reactivate productive capacity and alleviate distressed conditions in industries producing strategic minerals and metals.

Normal Mineral Programs

Stockpiling strategic and critical minerals and metals is, in effect, taking out an insurance policy against crippling shortages in times of national emergency. It is essential to the security, perhaps to the very life, of the Nation, but it is only part of the story of mineral conservation, which means wise use of our resources without unnecessary waste. To contribute to the solution of the problems involved in meeting our day-to-day requirements for minerals and fossil fuels, the Department conducts numerous programs. In cooperation with educational institutions, research foundations, and industry, it strives to encourage wise and careful use of known deposits, exploration for additional deposits, and the development of new and better materials.

Programs carried out through the Bureau of Mines to approach these objectives include: (1) Developing new and improved methods for processing known mineral resources to offset the declining grade of ore; (2) improving methods of extracting and treating minerals and fossil fuels to recover valuable materials now wasted; (3) improving conservation of available materials now wasted; (4) improving conservation of available materials through reuse; (5) developing processes that will broaden the resource base to include more and more of the oceans, the atmosphere, and portions of the earth's crust not now considered economically usable; (6) providings new and abundant materials to meet or offset expanding requirements for older, scarcer commodities; (7) solving production and utilization problems that will make hitherto unused metals and minerals with peculiar properties available to meet the increasingly diversified requirements of the consuming industries; and (8) finding means of synthesizing mineral raw materials to meet and fill gaps in domestic supplies and to create better materials.

Material and Fuel Problems Interlocked

Soaring demands for metals pose problems of both materials and fuels. Through the Bureau of Mines, for instance, the Department is seeking to develop feasible methods of utilizing low-grade bauxite and aluminum silicate rocks for the production of aluminum and of abundant ilmenite in place of scarcer rutile for the production of titanium metal. At the same time, because production of both aluminum and titanium, and of the third light metal, magnesium, requires tremendous amounts of electricity, soaring demands for them presents the problem of fuel.

Although about 20 percent of our electricity comes from hydro plants, the principal source for the immediate future will be installations burning coal, oil, or natural gas. Of these, our coal reserves are by far the greatest.

A Department research project, carried out by the Bureau of Mines in cooperation with a power company, culminated successfully last year with the opening of a generating plant burning dried lignite and designed ultimately to burn lignite char. The electricity will be used for aluminum production in Texas.

In making the char, tar also is produced. Since this tar differs from that obtained in carbonizing bituminous coal in coke ovens, studies are now being conducted to learn the nature and uses of the chemicals that can be produced from it.

This project already assures a future supply of low-cost electrical energy, and points to future development of a great but thus far little-used natural resource to yield not only fuel, but valuable coproducts as well.

Steel and Coking Coal

Assurance of enough steel for the future likewise presents both materials and fuel problems. On the materials side, the Bureau of Mines, enlisting the cooperation of industry, is conducted research on beneficiating low-grade and off-grade iron, chromium, and manganese ores, and on recovering manganese and iron from open-hearth steel furnace slags. The latter process is being tested by industry on a semiworks scale; its industrial utilization may one day supply half the Nation's annual manganese requirements.

On the fuels side, mindful that coke meeting rigid standards of strength and chemical composition is needed for blast-furnace use, studies are conducted on preparation of coals to remove impurities, blending of less desirable coals with better ones to make possible their metallurgical use, and reducing mining losses—now amounting to about 50 percent of the coal in the ground—without adding appreciably to costs.

The significance of such studies to the Nation's future is pointed up by realization that although our coal resources are tremendous, our reserves of high-grade coking coal are more limited and are being depleted rapidly.

Health and Safety in the Mines

The Bureau of Mines has a continuing program of advancing health and safety in the mineral industries.

Improved teaching methods, new publications, detailed studies of hazards and their elimination, fostering of interest in accident-prevention campaigns, and compilation of pertinent statistics on accidents and their causes are chapters in the Bureau's program. These activities are increasing constantly with corresponding reductions in accidents and a growing interest by miners and supervisors in the crusade against fires, explosions, roof falls, transportation accidents, electrocutions, and other mishaps that still take a heavy toll of lives.

Saving Coal From Fire and Flood

Currently idle coal deposits in many parts of the country lie in the path of fires, and encroachment of water threatens to cut short the life of the anthracite mining industry of Pennsylvania. Both threats are of concern to the Department.

Fire-control work carried out through the Bureau of Mines already has saved for coming generations more than 200 million tons of coal, some in the West and some in the thickly populated East. Other millions of tons of coal of all ranks still lie in the path of fires, and measures are being developed by the Department to guard these irreplaceable reserves.

In eastern Pennsylvania, flood waters already have inundated millions of tons of anthracite, of which the Nation's reserves are extremely limited, and have hastened the closing of mines in this hard-pressed area. Through studies already completed and additional reports under preparation, the Department will be equipped to provide engineering assistance to comprehensive drainage and flood-control programs to save such reserves for tomorrow's needs.

Oil and Gas

Since 1946 this Nation has discovered more than 1½ times as much petroleum and over twice as much natural gas as it has produced.

During 1953, the petroleum industry achieved the Government-established goal of capacity to produce, transport, refine, and distribute one million barrels a day in excess of current requirements. This reserve capacity, equalling about ⅛ of present consumption, assures the Nation of enough petroleum products to meet a sudden emergency.

Historically, the production methods used have recovered less than half the oil originally present in the ground. The Bureau of Mines is conducting studies aimed at increasing this proportion. As an example of progress, ultimate recovery from one pool is expected to be increased by 720 million barrels. Opportunities for similar contributions are almost unlimited and the Bureau is ever watchful for an opportunity to assist.

Oil Resources of the Continental Shelf

The enactment of the Outer Continental Shelf Lands Act in 1953 paved the way for the development of oil, gas, and other mineral resources of the outer Continental Shelf. The Interior Department has been assigned the duty of supervising and regulating this development.

The outer Continental Shelf adjoining the United States, particularly in the Gulf of Mexico, represents one of the few remaining petroleum and mineral provinces that is largely unexplored. Although its development will require many years, a firm foundation has now been laid.

As a result of settlement of the offshore oil controversy through legislative action by the 83d Congress vigorously supported by the

Administration, offshore oil production is expected to increase greatly and bring substantial royalty payments to the Federal Treasury.

The discovery of oil under the water of the Continental Shelf and the development of methods of extracting it constitute a tremendous achievement of American science and enterprise. For years the development of this resource was hampered by litigation and political dispute. The action of Congress has now made it possible for development to proceed, in both State and Federal areas, thus adding a tremendous potential supply to the Nation's oil reserves.

Synthetic Fuels

To postpone the day, predicted by some authorities, when the margin between our productive capacity and our rising requirements for petroleum will narrow, the Department cooperates with industry in both immediate and long-range research.

An important line of attacking the problem of meeting rising demands for liquid fuels is research upon their production synthetically not only from coal, but also from oil shale.

Our oil-shale resources have gone unused partly because of a feeling that mining costs would be prohibitive. The Bureau of Mines has developed and tested techniques and equipment that have shown these fears to be groundless. This accomplishment, coupled with the development and testing of retorting and refining methods, has brought down the cost of shale oil until it is approaching that of natural petroleum. It is anticipated that industry now will assume some of the research load in this field.

Exploration Programs

The activities of the Defense Minerals Exploration Administration, designed to encourage exploration for strategic and critical minerals and metals, are an important aspect of the Department's efforts to aid in the development of new sources of minerals for the future.

Under the Defense Minerals Exploration Administration program the Government shares in the cost of the exploration. Specific projects for exploration are established by contract in which the Government participates to the extent of 50 or 75 percent of the cost, depending upon the mineral sought. The amount contributed by the Government is repayable as royalty from the net sales receipts for any ore produced.

From the beginning of the program in mid-1951 to June 30, 1954, 2,221 applications for Government aid in exploration have been received from 24 States and Alaska. During fiscal 1954 Defense Minerals Exploration Administration approved 130 contracts, bringing the total number of contracts executed since the inception of the program to 647. Government commitments in contracts executed in the past 12 months amount to $4,275,001, bringing the total to date to $19,371,100. Industry participation in the past 12 months has been $2,479,475, with a total to date of $12,446,624.

Substantial quantities of minerals have been found. Current production is small, coming principally from ore removed during the exploration work, but as mining operations are expanded the ultimate production will be important to the national economy and defense.

In addition, during the search for higher grade ore, deposits of lower grade have been found which may be brought into production in the future. These constitute a reservoir of strategic minerals which is an important element in the Nation's preparations for the minerals problems of tomorrow.

Geologic Investigations

The urgency of the search for new sources of essential minerals demands a continual improvement in the techniques of mineral exploration. In recent years, all of the physical sciences have been drawn upon, sometimes in dramatic fashion, in the endeavor to pierce as quickly and accurately as possible the geologic problems which hold the key to new mineral wealth.

The focal point of much of the Government's activities in this scientific research is the Geological Survey. The application of airborne magnetometer and radioactivity methods, and the modification for field use of various laboratory techniques in geochemical and geobotanical prospecting has been pioneered by the Survey and found wide favor in the mining industries.

Through its scientific facilities and vast accumulation of data the Survey will undoubtedly continue to make significant contributions in this field so important in the overall task of providing resources for tomorrow.

Only a small proportion of the Nation's total supply of the principal minerals is located on the public lands, but as a part of the overall minerals development program of the Nation it is essential to assure the proper supervision of development and producing operations on these Federal and Indian land mineral leases.

This activity, carried out by the Geological Survey, includes enforcement of the applicable operating regulations and lease terms, and the requirement of adoption of safety measures designed to protect the resources from underground loss or damage.

Liberalized leasing regulations have accelerated prospecting. Since 1945, for instance, sufficient reserves of potash have been discovered to meet the anticipated national needs for this commodity for more than 150 years. Recent explorations have brought to light prospective sources of strategic minerals on national forest lands: Nickel and copper in Minnesota and Wisconsin; lead and zinc in Missouri; manganese in Arkansas, Tennessee, and Virginia.

The importance of assuring wise use or preservation of leasable minerals and oil and gas is illustrated dramatically by the importance of these products to this country's economy, protection, and physical welfare. During the fiscal year just closed, royalties accruing from leasing operations on federally owned and controlled lands amounted to nearly $49,000,000.

Anticipating the Atomic Age

As the atomic age advances, fissionable materials, particularly uranium and thorium, will be outstandingly important. Greater use of electronic equipment will enhance the importance and consumption of many of today's so-called rare metals such as germanium and selenium.

New alloys with superior physical, chemical, and electrical properties most certainly will be developed in the years ahead and will lead to increased demands for many of the uncommon metals, including the rare-earth metals.

To help assure that such demands will be met, the Bureau of Mines has been studying new techniques for beneficiating various types of uranium ores. It also has conducted metallurgical research on monazite sands—the principal sources of thorium and the rare earth metals—thus acquiring more knowledge of rare earth metals and compounds. The development of new and improved processes for recovering these elements from their ores is anticipated.

Impetus has been given to the production of uranium through the passage of legislation by the 83d Congress with full Administration support providing for the multiple use of our public lands. Formerly, production was handicapped by legal problems and complex leasing procedures. Since a very large part of our uranium supply comes from public land areas, this new legislation is of vital importance in accelerating the output of this critical material.

The new legislation will also aid in increasing production of other minerals and fuels. Some 60 million acres of public lands under lease for oil and gas production are now open for mineral development. Previously mineral development was excluded from the area. On the other hand, millions of acres of public lands on which mineral development will undoubtedly occur have also been opened to lease for oil and gas production.

Mineral Imports

The United States, although by far the world's leading producer of mineral wealth, also depends wholly or in part upon imports for several essential minerals. The knowledge and background of the Department are used to keep the Nation abreast of developments in the mineral field abroad, and its professional skills and experience are on call to assist in the solution of technologic and economic problems of the mineral industries in friendly foreign countries, so that supplies of such minerals from foreign sources may be available to our industries when and as needed.

PUBLIC LANDS

In the field of land management the Department has the primary responsibility with respect to an area (including Alaska) of more than 600 million acres. Of these lands by far the largest part (over 500 million acres) is administered by the Bureau of Land Management. BLM-administered lands consist for the most part of those lands, mainly in the West and in Alaska, remaining in Federal ownership today after many decades of settlement and acquisition of lands from the Government by our pioneers under the homesteading and other public land laws.

In addition to these lands, extensive areas embracing over 300 million acres of the public domain have been reserved for national forests, national parks, irrigation projects, military or atomic energy use, and other purposes.

Under the numerous public lands laws, over a billion acres of public land have been disposed of in the United States and Alaska since the founding of our Nation. There are nearly 500 million acres remaining in the public domain subject to possible disposal. Most of the latter lands are not now in demand, but population increases and shifts, technological improvements, and steadily improving economic conditions constantly create new demands.

The Department executes the land laws providing for disposal of such lands. Strenuous efforts have been made during the year to speed up the issuance of patents and the processing of other necessary governmental actions.

Lands for such purposes have also been made available through a policy of revoking unnecessary withdrawals. In past years much public land that clearly will never be needed for public purposes was withdrawn from private use. A continuous program is now underway to revoke such unnecessary reservations of public lands. Revocations in the United States and Alaska during the fiscal year totalled close to 2 million acres and action on several million more acres is being considered.

Land resources in the United States are mainly developed and utilized by individuals. That is the situation whether the lands are privately owned or are in the public domain. With respect to federally owned lands Congress has through the years enacted a host of laws dealing with their use by the private segments of our economy. Under these laws it is a basic mission of the Department to integrate the public domain with the private economy so far as feasible, consistent with the continuing objective of the wisest and soundest use. The Department remains responsible for assuring sound resource management and development of such lands.

The Bureau of Land Management also works constantly with the land users to insure that sustained yield practices will be followed, in order to provide a resource base for future generations. A basic principle of conservation is to provide incentives to the land users to leave something for tomorrow. That is achieved through guaranteeing land users security of tenure on the lands they use.

As a result of such policies, individual land users not only cooperate with the Government in sound conservation practices, but commonly also take the initiative in making conservation improvements which build up productive values, far beyond the capacity of the Government to achieve alone. Other relatively inexpensive functions of the Bureau, such as cadastral surveys for the identification of boundaries, and land use planning and classification, help lay a sound basis for the most productive use.

The execution of these responsibilities has been given additional impetus by the recent reorganization of the Bureau of Land Management which provides for further decentralization of operations and the amalgamation of all the technical staffs into a technical bureau.

Forestry

The forest lands administered by the Bureau of Land Management fall into three categories: (1) The revested O & C Railroad grant lands and other areas generally identified as O & C lands; (2) public domain forest lands in the continental United States, and (3) the public domain forest land in the Territory of Alaska.

These forest lands, which approximate 2½ million acres in the O & C area, 4½ million acres on the United States public domain and 40 million acres in Alaska, contain a basic resource having an actual value of billions of dollars. When such a resource is made available to private entrprise each dollar's worth of raw material permits the gainful employment of labor to create and fashion new goods and structures which add immeasurably to the wealth of the Nation. It is the goal of the Bureau to enhance and perpetuate this wealth by proper management. Timber, being a renewable resource, can be so managed.

Forest management on the O & C lands, practiced under the sustained yield act of 1937, is steadily increasing the value of an already valuable resource. The act carries out the principle of good management by limiting the harvest to a rate that does not exceed the sustained yield capacity, thus insuring a continuous annual timber supply.

The public domain forest resource in the United States is scattered over 11 western and 11 eastern states from the Atlantic to the Pacific. The principles of forest management applicable to O & C lands also apply to public domain. To perpetuate the forest resource on this scattered area, the major problem, after providing adequate protection, is to overcome the fragmented pattern of ownership. Wherever feasible the practice of private tree farming is facilitated and extended either by integrating the management of public domain forest with such enterprises. or by sale of isolated tracts of public domain forest lands.

Controlled cutting, intelligently planned access roads, increasingly better protection, constantly improving forest practices, and more and more reforestation, are reflecting the effects of proper management on Bureau of Land Management forest lands. These activities serve to increase the harvest of salvage and overmature timber, and turn more acres over to the immature growing stock that will supply future generations with wood products, insure recreation values, and protect water supplies.

Cadastral Surveys

Prudent management in any field of activity requires knowledge of the limits to which that activity can be applied. Cadastral surveys provide this knowledge in land matters by creating and establishing the boundaries of the public lands, identifying the subdivisions of those lands, and affording descriptions and areas for management and title purposes. Those surveys differ from purely informational surveys conducted by other agencies in that the land boundaries are actually established and marked on the ground by substantial monuments. An equally important part of the cadastral program is the reestablishment of survey lines and corners which have become obliterated due to passage of time and destructive forces of the elements.

Of vast importance to the nation and to the industry has been the establishment of suitable leasing units, by cadastral processes, on the outer continental shelf in the Gulf of Mexico. This affords a basis for the leasing of those areas and the development of the tremendous mineral potential beneath the waters of the Gulf.

In carrying out this cadastral program, attention is given to the long range needs for establishing land boundaries for the future development and conservation of our resources.

Classification, Use, and Disposal of Public Lands

Land classification is a tool whereby lands may be put to their highest use. Land classification is also a means whereby the land ownership pattern may be simplified for more efficient management.

It should be noted, however, that land classification has never been applied in Alaska since in a large, undeveloped area such as this Territory it is generally more feasible to permit development to proceed along the lines that seem most appropriate to the individual settler.

The principles observed in the classification, use and disposal of public lands are:

(1) Place in private ownership those public lands which are adaptable to agricultural production.

(2) Place in private ownership those public lands which are isolated from other public lands and not subject to efficient public management.

(3) Retain in public ownership for sustained-yield management those lands which are not suitable for private ownership under present conditions. These lands consist of sustained-yield forest units, grazing lands not susceptible to individual ownership, and other lands which are needed for public use.

(4) Place in State or local ownership those lands which are used and can be efficiently managed in the public interest by local governing bodies.

Because of the selective manner in which the public domain was disposed of under the public land laws, the remaining public domain in many areas presents a problem of land ownership pattern. An intermittent and intermingled land ownership pattern is a deterrent to proper land use and conservation practices. It is the responsibility of the Bureau to so manage public domain that the land ownership pattern is simplified. This will contribute to better use of both public and private lands.

Simplification of the land ownership pattern is presently being accomplished by land sales, private land exchanges, exchanges of lands with the States, restoration of public lands from restrictive withdrawals, and selective disposals under various public land laws.

The Bureau's lands program is pointed toward consolidation of lands producing timber and forage so that they may make maximum contributions to the local and national economy.

Range Management

Continued progress in the management, conservation, and improvement of the public land grazing resource has reversed the trend of range deterioration in past years. Adjustments in grazing use to the sustained productivity of the forage resource and gradual improvement of the soil through conservation practices will help assure an adequate forage supply to serve tomorrow's needs.

The range administration activities of the Bureau are directed toward the full utilization of the Federal range forage resources in the future and continued stabilization of the livestock industry dependent upon them.

Present day technology applied to range conservation practices is demonstrating the full potential of increased productivity. The success of the Bureau's range waterspreading practices has attracted international attention as an effective soil and water conservation measure. Great strides have been made in the field of artificial range revegetation, although millions of acres of public rangeland still remain in need of treatment to attain maximum productive capacity.

Both immediate and long time programming of the Bureau's conservation activities is based on a watershed approach in order to fully utilize the available physical data obtained from river basin and similar studies. Recently this programming has also been geared to the Department's twenty-year plan of conservation for all Interior lands. Long time plans also provide for needed range improvements such as stockwater, fencing, truck trails and similar measures to facilitate use of the range. While many such improvements have been installed, much remains to be done. The accomplishments here as in range administration and conservation all provide positive evidence of proper resource management for the future.

INDIAN RESOURCES

Lands held in trust by the Federal Government for Indian tribal groups and individual Indians, comprising more than 54,000,000 acres, are a factor of major importance in the future resource picture of the Nation and particularly of the West.

It is the purpose of the Department to terminate Federal supervision as rapidly as the Indians are ready and willing to assume the full responsibilities of citizenship and where the States and local governments are prepared to render them normal community services. As this process takes place, the Indians will assume themselves the management of the resources of their lands. The Federal programs directed to conservation of these lands and resources, therefore, must look to that day.

Although some parts of the Indian estate are sharply limited in economic value and a few areas are virtually worthless, the combined area still looms large in significance. It includes, for example, about 850,000 acres of irrigated land which in 1953 produced crops valued at more than $40,000,000. Nearly a third of the area, about 16,000,000 acres, is forest land with an estimated volume of 41 billion board feet of timber. Roughly 30 billion board feet of this total is on 6 million acres classed as commercial forest.

Also included in the total are more than 44 million acres of rangeland with an annual grazing capacity for 880,000 cow units and an annual use value of $6,500,000.

Underlying the Indian lands are deposits of oil, gas, uranium, and other minerals which, in the year ended June 30, 1954, produced an income for Indians of over $30,000,000. Many of the Indian lands, located in key watershed areas, are vitally important from the standpoint of streamflow and reservoir protection.

The future of these Indian resources must be considered from two points of view. On the one hand there is the prospect that increasing portions of the Indian estate will move out of trust status and into unrestricted private ownership as additional Indians and Indian groups reach the level of competence where they are able to manage their assets without further Federal supervision. On the other side is the job which remains to be done in developing, managing, and conserving Indian resources prior to the eventual termination of trusteeship.

New Legislation

The 83d Congress undoubtedly achieved more progress in providing Indians with full authority and responsibility for handling their own economic affairs than any previous Congress in the Nation's history. During the first session it adopted, in House Concurrent Resolution No. 108, a basic policy that Indian tribal groups should be given such authority and responsibility as rapidly as feasible. In the second session it held hearings on a substantial number of bills designed to accomplish this purpose for particular Indian groups, enacted one into law during the fiscal year 1954, and had several others under active consideration at the end of the fiscal year. Involved in these measures were two of the most important Indian timber holdings in the country—those of the Menominee Tribe in Wisconsin and the Klamath Tribe of Oregon.

What the ownership pattern of Indian lands will be after termination of Federal trusteeship is impossible to predict since the decision will be made by the Indian owners and not by the Federal Government. As an illustration, legislation for the Klamath Tribe, developed in accordance with recommendations of the tribal leaders, specifically provides for dividing the tribal holdings into two major segments. One of these would be sold and the proceeds distributed to those members wishing to withdraw their individual shares of the tribal assets. The other would be held in tribal ownership and managed for the benefit of individuals choosing to remain in the tribal organization.

Other termination bills considered by the 83d Congress provide the Indians affected with an option of disposing of their property or continuing to manage it either through a private trustee or as an organized group.

Pending the eventual termination of Federal trusteeship, the Bureau of Indian Affairs has a continuing responsibility to safeguard the Indian trust lands and to promote their effective development and use to the fullest possible extent. This involves principally conservation of the soil and water resources, proper development of the mineral assets, sound management of Indian forests and ranges, and assistance to Indian farm families in agricultural and home-making techniques.

Soil and Moisture Conservation

The soil and moisture conservation program of the Bureau is in the process of rehabilitating the 55 percent of Indian lands with severe and critical erosion and of saving from destruction the 45 percent where erosion is slight to moderate.

The application of conservation and improved land treatment measures, combined with healing natural processes, frequently develops the soil to a higher state of productivity than that found under virgin conditions.

The Department's 20-year plan for soil and moisture conservation as developed by the Bureau for Indian lands is aimed at stepping up production to keep pace with the population increase. On irrigated lands production will be greatly enlarged by the better usage of water resulting from leveling, revision of distribution systems, the control of salts and improvements in method of application which better control the amount of moisture available for plant growth.

On dry farmland similar results will be achieved by the installation of upland waterways, terraces, and contour farming; the production of cover crops, including legumes, in rotations to increase soil nitrogen and organic material; improvements in tillage practices including rough tillage and subsurface tillage; the introduction of new crop species, weed control, and the application of fertilizers as part of the farm conservation plan.

On rangelands the work will emphasize brush removal, reseeding, and water spreading to increase the yield palatable of forage and development of ponds such as the improved deep-pit charco, as a means of obtaining better distribution of stock and making more effective use of the forage.

Soil and moisture conservation is also an extremely valuable part of the termination program in Indian affairs. It prepares the individual for high-caliber citizenship. The Indian plans with technicians the future of his operations and his land. He puts the plans into effect and year by year improves his property and its productive capacity. In the process he becomes economically independent.

Mineral Resources

The widespread exploratory interest on numerous Indian reservations and the extensive leasing of lands for development of oil and gas and strategic minerals indicate that these lands will contribute materially to the future needs of the Nation. Income to the Indians from oil and gas and other mineral development has been increasing steadily for the past several years and in fiscal 1954 reached a peak of more than $30,000,000.

In contrast with earlier years when mineral development on Indian lands was largely confined to Oklahoma, many tribes in other parts of the country are now benefiting from exploration operations.

The orderly development of oil and gas and other minerals is the program for the period ahead. This will be accomplished by unity of purpose and action in which the Indian landowners and the industry take the leading part. The program is implemented by oil and gas unit and communitization agreements and cooperation with the State agencies. Such a program will serve to prolong the life of the oil and gas fields, meet future petroleum needs, and increase the income of the Indian landowners. This program had its start on Indian lands in Oklahoma in the 1920's and has resulted in prolonging the life of the fields and materially assisting in meeting the demand for petroleum.

As far as strategic minerals are concerned, recent developments on reservations in New Mexico, Arizona, and Utah, warrant an optimistic outlook.

Timber Resources

The management of Indian forest lands contemplates their conservative development and use, by the Indian people, for the purpose of promoting self-sustaining communities. It is concerned, in other words, with human as well as forest resources. The ultimate objective of the Indian Bureau's forest management program is to help those tribes with timber resources to reach the point where the present Federal trusteeship may be terminated and the estate turned over to the Indian owners.

Although much remains to be done, there has been notable progress in the management and conservative use of Indian forests under Government supervision. The present annual timber harvest from the 6 million acres of commercially valuable Indian forest is about 575 million board-feet. The annual income to the Indian owners, in the form of stumpage payments, amounts to more than $9,000,000.

Because of fund limitations, it has not been possible to develop the forests on all Indian reservations to their full productive capacity. To accomplish this will require reliable data regarding present volumes and growth potentials, and access roads to facilitate the harvest of overmature and decadent timber.

In the past 2 years the Indians of several reservations have made their own funds available to obtain forest inventories and to prepare management plans. While progress in access-road construction has been less encouraging up to now, the prospects for the immediate future seem to be somewhat brighter.

It is believed that, with full development, the present Indian forests are capable of producing about 700 million board-feet of commercial timber annually.

Extension Work

Through its extension program the Bureau of Indian Affairs has been making another contribution to the conservation and development of the Nation's resources by educating the Indian citizens to the value of their agricultural resources and the proper use of them.

This is being accomplished by gathering scientific and practical information relative to these resources and passing it on to the Indians in a form which they can understand and use beneficially. Meetings, short courses, observational tours, and field demonstrations are conducted at which Indians are advised concerning the proper development and use of their agricultural resources. This enables them to realize the greatest possible returns from their resources and, at the same time permits passing them on to future generations in a highly productive state.

FISH AND WILDLIFE

The Department's Fish and Wildlife Service, guardian of our Nation's free-moving creatures of the sea, air, land, and fresh-water areas, has set its sights on the year 1975 as a major check-point in its look to the future.

By that year, the available supplies of food fish must have increased by 25 percent in order that the nutritional needs of our anticipated human population may be met.

By that year, too, about 4 million American waterfowl hunters—nearly twice the present number—will be gunning for wild ducks and geese, expecting to find enough birds available to satisfy a reasonable sporting urge.

These demands, along with many others having no time limit, guide the Fish and Wildlife Service in planning and carrying out its programs.

Commercial Fishing

Although the combined commercial fisheries of the United States and Alaska yielded 4.4 billion pounds of fish and shellfish (valued at 345 million dollars) in calendar year 1953, this catch was considerably below the potential. Since fish and shellfish are particularly valuable sources of protein, utilization of food from the sea will have special importance in meeting the nutritional needs of the Nation's future population.

The production of haddock in the north Atlantic could be increased 50 percent by scientific adjustment of the fishing rate. There are great underfished resources of herring in the north Atlantic and west Pacific, of pilchard in the south Atlantic and south Pacific, of tunas in the central Pacific and south Atlantic, of cod in the north Pacific and the Atlantic. These latent stocks of fish constitute resources for the future, which present research and other activities of the Department are helping to conserve and make available.

Increasing the production of fish will not ensure improvement in the Nation's diet, however, unless these valuable food items are added to the menu. Already, steps are being taken by the Department to work toward this objective.

Probably the most important piece of legislation enacted in many years for the benefit of the Nation's commercial fisheries is the Saltonstall-Kennedy Bill approved by the 83d Congress. This bill earmarks $3,000,000, for a period of 3 years, from duties collected under the custom laws on fishery products, for transfer by the Secretary of Agriculture to the Secretary of the Interior. These funds are to be used in promoting the free flow of domestically produced fishery products in commerce by means of an educational service, along with technological, biological, and related research programs.

The average (per person) consumption of fish has hardly changed in the last 25 years. This new program, to promote understanding of the value of fish for food, should make a valuable contribution toward meeting the Nation's nutritional needs in the future.

In Alaska, because commercial fishing is the chief source of income, the Service keeps a watchful eye on aquatic resources. Conservation measures are applied constantly as a safeguard against overfishing. The salmon industry, which accounts for 90 percent of Alaska's fishery products (from the standpoint of value), has been fully exploited for a number of years. As a result, the Service recently found it necessary to protect the salmon by means of strict regulatory controls on the take of this species.

Through such measures future generations of Alaskans will be able to find a livelihood, as their fathers have done, in the north country's fishing bays, inlets, tidal basins, and open coastal waters.

Considerable effort has been made by the Service in recent years to expand the Territory's latent fisheries, with activities in this direction centering around the yield of king crabs and groundfish. The king-crab fishery has shown gains, and bottom fish are expected to form the basis of a recognized fishery in the near future.

The staff members of the Service's Pacific Oceanic Fishery Investigations is searching the seas around Hawaii and westward through the Trust Territory of the Pacific Islands for new sources of protein for the American dinner table.

Valuable information on the distribution of Pacific tuna is being obtained, along with facts on the abundance of this highly important food species. Similar studies are being made by the Service in Atlantic and Gulf of Mexico waters, with various species of fish and shellfish under scrutiny. New fishing grounds are being opened up, and improved methods of catching fish are being developed.

Trouble-shooting in connection with the Nation's commercial fisheries has been a necessity from the earliest days. Through biological research, the Service has suggested solutions which in some cases have alleviated such adverse situations as a sharp decline in the catch of haddock in the late 1920's; the recent invasion of Lakes Huron, Michigan, and Superior by the fish-killing predator known as the sea lamprey; and the mass mortalities of fish resulting from a plague called the "red tide" which has periodically infested the waters off the west coast of Florida.

International Cooperation

The past few years have brought increasing cognizance of the international aspects of fish resources, with the Service playing a prominent role. The need for cooperation among nations has become more apparent with each passing year, and the result has been a rise in the number of international fish-conservation agreements, as well as more active exchange of technological information and skills.

International teamwork recently resulted in substantial economic gain for the trawler fishermen of New England. On the recommendation of the International Commission for the North Atlantic Fisheries, the United States promulgated a new regulation designed to conserve undersized haddock. The small fish thereby spared for future seasons will be worth a million dollars each year, according to Service calculations.

Sport Fishing

In the interest of good sport fishing the Service is keeping constant vigilance over the Nation's game fish, concentrating particularly on reserve stocks and potentials for the anglers of the future. Service sport-fishery specialists have found that only through wise and careful management of our game-fish resources can stocks be expected to hold out under the heavy fishing pressures extant today and even greater pressures expected to develop in the years to come.

Fortunately, fresh-water fishery management is coming into its own as a science. With the aid of research, the Service is learning how to make better use of hatchery-propagated fish and how to rear better fish more economically. A good understanding of fresh-water fish populations, their environments, and their proper utilization is gradually being acquired and new techniques of fishery manipulation are being developed. By means of this fresh knowledge, stocks are both preserved and expanded.

Designed to restore and protect game fish for the future, the Dingell-Johnson program is a joint Federal-State endeavor administered by the Service. By means of this program, State sport fisheries are reaping the benefit of constant research and development activities. Land and water areas are being purchased to increase public fishing opportunities, and physical improvement projects in the fisheries are resulting in greater game-fish productivity as well as the creation of new fishing waters.

Migratory Waterfowl

Because of their migratory habits, American waterfowl are peculiarly the concern of the Federal Government. Seasonal flights carry some of our wild ducks and geese from the Arctic Ocean to the northern regions of South America and back again. Crossing international boundaries in spring and fall, these intercontinental migrations gave rise in 1916 to the Migratory Bird Treaty, whereby the United States and Canada agreed to give migratory birds the fullest possible protection against undue depletion. In 1936, a similar agreement was reached with Mexico.

To assure perpetuation of wild ducks and geese for the hordes of waterfowl hunters that take to the marshes each fall and winter, the Service works on a year-round basis studying and protecting these much-sought-after game birds. Breeding-ground, wintering-ground, and hunting-success surveys are conducted annually, and the result is a close check from one end of the year to the other on waterfowl survival trends.

The National Wildlife Refuge Program of the Service is a great general insurance program for the benefit of these birds. In many of the Nation's most heavily shot areas there are Federal refuges to harbor waterfowl when hunting pressures get too severe.

This refuge program has recently doubled the number of Canada geese in areas where waterfowl hunters do their shooting. During the next 10 to 15 years, if the program is carried forward to its goal, the number of geese in these areas will be tripled. A great deal of pressure has already been taken off the heavily hunted ducks.

Other birds receiving special attention at Federal refuges are the rare trumpeter swans and whooping cranes. Through careful study of these unique native species, and through scientific measures designed to increase their chances of survival, the Service is playing a leading role in saving them from extinction.

Alaska's Fur-Seal Herd

The successful handling of Alaska's fur-seal herd by the Federal Government has been cited by naturalists as an outstanding example of proper conservation and channeling of an animal population in the natural state.

Since the Government first assumed direct responsibility for this resource, 45 years ago, the herd's ranks have swollen from 125,000 to 1,500,000 seals. During this period more than 1,800,000 skins have been taken from male fur seals with no detriment to the herd, since these males were surplus to the breeding requirements of this highly polygamous species. The herd has now reached a peak of development, and a sustained annual yield of 60,000 to 70,000 skins is being maintained.

To preserve other wildlife for future generations, the Service administers the Pittman-Robertson program whereby game species are restored and protected through a variety of life-giving projects. These projects, initiated and conducted by the States, consist principally of research, surveys, land acquisition, and land development. Recent projects have given new impetus to the perpetuation of antelopes, elk, wild goats and sheep, deer, caribou, moose, bears, wild turkeys, quail, pheasants, grouse, and doves, to name but a few.

Control of Predatory Animals

The control of predatory animals such as coyotes, wolves, bobcats, and mountain lions is often a decisive factor in successfully stocking an area with desirable species. It is also a necessary management tool in building up game populations in localities where the ranks have been seriously depleted through overhunting or other causes.

Predator-control operations are carried out by the Service in many areas of the United States and Alaska. Although the Service's predator-control operations in the West are conducted primarily to reduce livestock losses, these operations are benefiting game species indirectly. As a result, profitable livestock production and continued hunting opportunities are being assured under one and the same program.

The Service has been called upon recently to participate in a number of multiple-purpose resource developments. As a result, it has been necessary to stress the importance of preserving fish and wildlife in the face of irrigation, flood control, electric power, and river-navigation projects.

When necessary and feasible, the Service is recommending the acquisition, in advance, of compensatory lands to replace wildlife habitat that would be lost as the result of reservoir construction. Lands at several Federal reservoirs were made available during fiscal year 1954 for management of wildlife and fishery resources by State and Federal conservation agencies.

The Service is forcefully pursuing its policy of protecting fish and wildlife in connection with all water-development projects. Uppermost in mind is the fact that these resources are important not only economically, but sociologically as well. The role these resources play in satisfying the growing need among the American people for outdoor recreation cannot be measured in dollars and cents.

Research for the Future

Recognizing the need for facts on which to base effective wildlife management, the Service is cooperating extensively with colleges and universities throughout the Nation in research and training activities. Research laboratories have been established, and biologists have been assigned to attack the problem of wildlife diseases and similar perplexing questions. Service researchers are playing a prominent part in the recognition of fish and wildlife surpluses, and in pointing out the advisability of harvesting these surpluses within sound biological limits.

Through these and many other research activities, the Service is laying the foundation for efficient planning, reasonable approaches, and enlightened action. As a result, longer-range conservation and better use of our fish and wildlife resources may be expected in the future.

NATIONAL PARKS

One of the most striking and significant social phenomena of mid-century America has been the tremendous surge of public interest in our national parks. If present trends continue, moreover, this interest is expected to grow at an even more spectacular pace in the future.

In 1910 only about 200,000 visitors were counted at all of our national parks. By 1920 this had increased to 1,000,000, in 1930 to 3,000,000, and in 1940 to 17,000,000. Following World War II, this upward trend was greatly accelerated. By 1950 more than 33,000,000 people were enjoying our parks each year and by 1953 the total had reached the record height of more than 46,000,000.

This continuing increase in the number of people finding recreation and enjoyment in our national parks is clearly the result of a variety of factors which are having an ever greater impact on our national way of life.

One of these factors has been the automobile. In recent years the automobile and the expanding network of good roads has made travel to once remote areas possible for millions of Americans. At the same time, our civilization has provided our citizens with increased amounts of leisure time to devote to personal interests, such as travel.

Other factors which have combined to focus attention on our national parks are the continued growth of population and the progressive urbanization of the Nation. Our cities are spreading over the landscape. As they grow closer and closer together, the once great vistas of open land and endless forests are being steadily reduced.

These developments have limited the areas in which we can enjoy the timeless beauties of nature at the same time that other tendencies have created a growing need and opportunity for such enjoyment.

It is clear, therefore, that as our Nation continues to grow, we will undoubtedly treasure with increased concern the areas of unparalleled scenic beauty and historic significance which have been set aside as national parks to be preserved for the enjoyment of all.

The Department is determined to meet its responsibility to care for and broaden these opportunities for enjoyment. As the need dictates and the opportunity arises, additional areas will be added to our national park system and existing areas further developed and expanded.

In keeping with this overall objective, the Department also will continue to work with local governments for the development of State parks, and will seek to utilize the full recreational potentialities of other areas, such as storage reservoirs and the lands around them.

DEVELOPING ALASKA'S VAST RESOURCES

In spite of all the wealth that has been produced in Alaska from fisheries, mines, furs, and forests, the real significance to the United States of this giant of the Territories lies in its development potentials. Alaska represents a vast storehouse of resources for the future because it is beyond question the largest and richest undeveloped area of the Nation.

The problems peculiar to Alaska, including commercial fisheries, land management, industrial and defense development, are being attacked by the Department on all fronts in an attempt to foster accelerated development of the Territory.

These activities include emphasis on the policy of freeing the lands of the Territory from unnecessary withdrawals to permit more land to pass into non-Federal ownership, thus hastening the development of these resources for tomorrow.

Alaska salmon operators and fishermen joined with the Department during the fiscal year in unprecedented conservation measures designed to aid in restoring the pink salmon runs in Territorial waters. These measures are an important part of the effort looking forward to a rich resource future for Alaska.

Another phase of the Department's activities in the Territory has been the successful attempt to improve the efficiency of its operations affecting the Territory, thus providing better public services as well as savings for the taxpayer. Illustrative of this effort was reorganization of the Alaska Railroad which has resulted in the replacement of a loss in fiscal 1953 by a $766,000 profit in fiscal 1954.

The future of Alaska is of international as well as national significance. It is not only an air crossroads of the world and a fortress of American defense; it is also part of an essentially single region of North America which includes northern British Columbia and the

Yukon territory in Canada. These related areas in the Dominion are equally undeveloped and equally important on a continental scale to the economics of the future. The international boundary between the Canadian and United States portions of this northland region is a completely artificial one. There is no geographic separation established by the physical features of mountains, valleys, lakes, and rivers. The full potential of this region, Canada's Northwest as well as Alaska, can hardly be realized until the two nations find a way to join hands in the utilization of its natural wealth.

Tremendous Hydro Potential

Water resources furnish the most dramatic example of this political economy relationship. On the Canadian side of the boundary that separates British Columbia and Yukon territory from Southeastern Alaska are enormous supplies of water, most of which flows northward to enter the Yukon River system or westward through gaps in the coastal Rockies to the sea. On the United States side the mountains slope precipitously to the Pacific Ocean, furnishing a huge power potential if Canadian water can be brought through the mountains to take advantage of the abrupt drop in altitude.

Competent engineers have appraised this power potential as among the greatest in North America, with estimated costs at phenomenally low levels. Further south at Kitimat in British Columbia the Canadians have proved the size and cheapness of a similar power supply in an area where Canada controls both the water and its outlet to the ocean. An aluminum empire, based on cheap power and including a new city, is being built in this portion of the Canadian wilderness, thus providing a large-scale demonstration of the practicability of this kind of enterprise.

On an international basis, the same kind of development is possible in the Alaska-Canadian areas north of Kitimat, but it will require new principles and new techniques of cooperation between the two nations to accomplish it.

Alaska's Forest Resources

Alaska not only has many other waterpower possibilities in stream valleys which it wholly controls, but many other resources of importance to the economic welfare of the United States. Among the most important of these are Alaska's forests, which cover the coastal slopes of the mountains from Ketchikan to the Kenai Peninsula. Here is one of the last great virgin forests of the world, so protected by humidity and rainfall that fire damage has never been a serious problem.

While there has been some use of Alaskan timber on a small scale for many years, the recent opening of a multi-million-dollar pulp mill near Ketchikan represents the first large-scale use of this forest resource. Since the coastal forest cover stretches far to the north in the Tongass and Chugach national forests, there are many opportunities for other industrial plants of a similar character.

Petroleum Possibilities

The petroleum possibilities of the far north are so great that oil companies have been busy in many parts of Alaska exploring and leasing oil lands, while in some areas drilling operations are under way. Navy exploration has already demonstrated the existence of oil and gas resources north of the Brooks Range. Other prominent structures now being actively explored are in the Yakutaga-Katalla area near Cordova, in an area near Chinitna Bay, at the base of the Alaska Peninsula, and in a region east of Palmer. Geological investigations are also under way in other parts of Alaska.

In these explorations the Department of the Interior has a heavy responsibility in the issuance of leases and in providing map services, geological data, and supervision over the oil development, and a transportation responsibility arising from its operation of The Alaska Railroad and the Alaska Road Commission.

Mineral Resources in Alaska

Although many millions of dollars have been taken from Alaska's wealth in gold, copper, coal, and other minerals, the full extent of Alaska's mineral resources is not yet known. The areas of exploration and possible exploration are so vast it is not improbable that additional discoveries will be made for many years to come. The absence of adequate transportation, except air transportation, now makes it necessary to concentrate on very high grade, high value deposits.

For the development of Alaska's resources of the future a great deal depends on the work of the Department's Geological Survey and Bureau of Mines. The work of territorial agencies centered at Juneau and at the University of Alaska, at Fairbanks, is also making its contribution. Above all, land problems emphasize the partnership relation between the Department of the Interior and local enterprise in both the use and conservation of the Territory's resources.

There are many other Alaskan resources, the future use of which depends upon a partnership relation between business and government. The handling of fishery resources is one of these. Except as the Department of the Interior, Alaska's fishermen, and Alaska's salmon canning interests can find effective and rational ways to conserve fishery resources in the present, the significance of fisheries as a resource for the future may continue to decline.

The problems of conservation of resources involve use as well as conservation. A mature forest deteriorates when the crop is not harvested. On the other hand mining operations limited only to the extraction of the highest grade ores make more difficult the profitable mining of lower grade deposits which may be greatly needed by future generations.

Many governmental agencies in addition to the Department of the Interior are involved in the conservation and resource use problems of the territories: the Department of Agriculture in its assistance to farmers in the Matanuska and Tanana valleys and on the Kenai Peninsula; the Department of Commerce in its aid to the development of territorial aviation; the Department of the Treasury through the activities of the Coast Guard, and others.

Other Territories

In territorial areas of the United States other than Alaska the use of existing resources is of far more importance to future economic progress than is the expectation of finding previously unexplored sources of wealth. This would seem to be true of the Commonwealth of Puerto Rico and the Territory of Hawaii. In such areas conservation is necessarily of overriding importance.

In any consideration of the utilization of physical resources it must never be forgotten that human resources are paramount, for it is only in their effect upon human welfare that the use and conservation of physical resources have any meaning.

In all territorial areas political developments go hand in hand with economic growth. A free people are the most productive and the development of both the form and substance of self-government is not unrelated to the wise use and conservation of resources. In this field the Department through it Office of Territories will continue its historic mission of assisting territorial peoples in establishing the conditions which make representative government possible, and of providing ever-increasing opportunities for them to participate in that government.

CONCLUSION

Gifford Pinchot, one of the greatest conservation leaders of this country, summed up the essence of sound resource planning when he said ". . . conservation is the farsighted utilization, preservation, and renewal of forests, lands, and minerals, for the greatest good for the greatest number for the longest time."

This time-tested doctrine has provided a guiding philosophy for the Interior Department's many resource activities. We think, as this report has indicated, that a good job is being done. It could, of course, be better. There is a constant need for reexamination of our resource programs to insure that necessary reorientations and changes are made as required.

In the past year, significant progress has been made by the Department in providing better public service at the same time that savings were achieved for the taxpayer. This resulted from a series of comprehensive administrative actions which were launched shortly after the new administration assumed office. Early in 1953, survey teams were appointed and asked to make a detailed review of the organization and operating procedures of each of the Department's bureaus and offices in order to develop the most efficient means of accomplishing the Department's programs. These teams included top level management personnel from industry and expert professional consultants as well as selected personnel from within the Government but outside of the bureau being studied. At the conclusion of these surveys, the teams made recommendations for organizational and operating changes to increase efficiency. These changes have been approved and at the end of the fiscal year most of the necessary bureau reorganizations have been completed.

As a result, it has been possible to reduce the Department's personnel costs by an estimated $15,000,000, while improving services to the public. This saving was brought about in the main by increased efficiency. In previous years, the Department's employment had been substantially increased in anticipation of budget allocations which Congress did not enact. The personnel reduction which was achieved in the fiscal 1954 was, therefore, in conformance with the actual workload being carried by the Department and did not constitute a curtailment of operations.

These efforts to increase administrative efficiency, as well as allied activities in a variety of fields to assure the soundest possible programs for fulfilling the Department's responsibilities, will be vigorously pursued.

We shall continue to work as earnestly and as creatively as we know how to insure that the resource needs of tomorrow as well as those of today are met fully and efficiently.

PART II

ANNUAL REPORTS OF THE BUREAUS AND OFFICES OF THE DEPARTMENT OF THE INTERIOR

Office of the Assistant Secretary Water and Power Development

Fred G. Aandahl, *Assistant Secretary*

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THE Assistant Secretary—Water and Power Development—is responsible for the supervision and direction of the water and power agencies of the Department. These are the Bureau of Reclamation, Bonneville Power Administration, Southeastern Power Administration, and the Southwestern Power Administration. The latter three agencies are solely marketing agencies for the sale of surplus electric power generated at Federal dams in their respective areas. The Bureau of Reclamation undertakes the construction of projects whose primary purpose is the reclamation of arid and semiarid lands in the western part of the United States and also markets power in this area outside the boundaries of the Bonneville Power Administration and Southwestern Power Administration. The activities of these agencies are more fully described in sections of this report covering each of the Department's bureaus and offices.

In addition, the Assistant Secretary—Water and Power Development—exercises responsibilities which are not exclusive to any one of the Department's operating bureaus or agencies, but which involve particularly the consideration of problems of a broad, overall, or policy nature. These include the supervision of the Saline Water Conversion Program, which is described in a separate chapter in this report, and coordination, review, and preparation of Departmental comments on water and power project proposals submitted by other Federal agencies to this Department. During the fiscal year ended June 30, 1954, the Department, through this office, reviewed 40 reports of the Corps of Engineers, Department of the Army, concerned primarily with flood control and navigation; 18 reports of the Department of Agriculture concerned primarily with runoff and waterflow retardation; 19 reports of the Public Health Service, Department of Health, Education, and Welfare, concerning water pollution; and 50 applications for permits and licenses under the Federal Power Act.

The Assistant Secretary—Water and Power Development—actively participated in the negotiation of contracts for the sale of power in the Southeast and Southwest begun during fiscal year 1954. Marketing criteria for guidance in future contract negotiations for the disposal of power by the Bureau of Reclamation in the Missouri River Basin were also issued.

Policies were reviewed and formulated for the marketing of power and the preparation of adjustments in rates by the Bonneville Power Administration. Instructions were issued for a comprehensive analysis and review of the Missouri Basin program. General agreement was reached with the Corps of Engineers and the Federal Power Commission on methods and related factors for the determination of allocations of cost of multipurpose projects.

The Assistant Secretary—Water and Power Development—participated with representatives of the Department of the Interior and other interested Federal agencies in discussions with representatives of the State of California on the proposal of the California Water Project Authority for State acquisition of the Central Valley Project. He also serves as Departmental representative on the Inter-Agency Committee on Water Resources which replaces the former Federal Inter-Agency River Basin Committee. The purpose of the reorganized committee is to provide for the establishment of policies and procedures for facilitating the coordination of interests and programs of the various Government agencies concerned with water resource development.

The residual functions of the Defense Electric Power Administration, which was abolished as of the close of business on June 30, 1953, were transferred to the Office of Assistant Secretary—Water and Power Development. The major functions remaining pertain to the E–5 rated program and the Electric Power Goal No. 55.

The Office of the Assistant Secretary—Water and Power Development—is the allotting agency for the E–5 program consisting of 89 generating units, with nameplate ratings totaling 10,721,000 kilowatts to be installed on or before June 30, 1956. These E–5 rated units are essential to adequately furnish interim, firm, and backup electrical power to Atomic Energy Commission installations.

The approved Electric Power Goal No. 55 provided for the expansion of generating facilities by 41 million kilowatts for the 4 years 1952–55, scheduled for completion by December 31, 1955, and 1 million kilowatts for certain special defense related projects to be completed in 1956. This goal has been filled with installations presently scheduled or in operation and was placed under suspension December 3, 1953. No new applications for certificates of necessity for accelerated tax amortization have been certified since this date. However, scope and time amendments to all projects previously certified are eligible for consideration under Electric Power Goal No. 55. There have been granted 668 certificates involving 20,126,605 kilowatts at an estimated cost of $3,852,589,102 for electric utilities, and 32 certificates for 505,150 kilowatts at an estimated total cost of $111,525,770 for industrial power projects.

Bureau of Reclamation

Wilbur A. Dexheimer, *Commissioner*

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INTRODUCTION

THE Bureau of Reclamation made substantial contributions to the economic structure of the Nation during the 1954 fiscal year. Construction work went forward under a budget of $186,000,000, which resulted in the addition of about 2,200,000 acre-feet of water storage capacity in new reservoirs, irrigation facilities for about 322,000 acres of land, and the installation of about 297,250 kilowatts of hydroelectric generating capacity. Operation and maintenance continued satisfactorily during the year with four projects or units of projects being turned over to water users' organizations for operation making 97 units now under the direct administration of the local contracting bodies.

Renewed emphasis was placed on local participation and responsibility at all levels of planning, construction, and operation and maintenance.

Concurrently, numerous organizational changes were effected to provide greater efficiency and economy in Bureau of Reclamation operations in 17 Western States and Alaska. The technical aspects of irrigation and power operations and project investigations were transferred to the Bureau's Denver offices, and these activities, together with facilitating services which had previously been operated independently, were combined with design and construction functions to constitute the office of the Assistant Commissioner and Chief Engineer at Denver.

The consolidation of these technical activities made possible improved efficiency and reduced costs, and permitted the implementation of more uniform policies and procedures in the Bureau's planning, design, construction, and operation and maintenance work. At the same time the Commissioner retained policy direction and responsibility in the Washington office with Assistant Commissioners for Administration and Irrigation and Power.

DESIGN AND CONSTRUCTION

In fiscal year 1954 an investment of $148 million in new construction of irrigation and power facilities was added to the Bureau of Reclamation's projects in the West and in Alaska. These facilities included concrete and earth dams, power and pumping plants, irrigation canals and their extensive lateral systems, electric transmission lines, and other works which will contribute materially to the conservation and development of the Nation's land and water resources.

Construction completed during the year added about 2,200,000 acre-feet of water storage capacity in new Bureau of Reclamation project reservoirs, 297,250 kilowatts of hydroelectric generating capacity, 700 miles of canals, pipelines and laterals, and more than 100 miles of major electric transmission lines.

The total value of all contracts awarded in the year amounted to about $65 million, comprising the face value of over 250 separate contracts for construction, materials, equipment and supplies. Construction contracts comprised about $57 million, or about 87 percent, of this total contract aggregate. Construction contracts in force at the end of the fiscal year totaled about $194 million.

The year's construction accomplishment provided irrigation facilities for about 322,000 acres of land. Construction will continue during the next fiscal year on 30 projects and 16 units of the Missouri River Basin project, as well as preconstruction activities on authorized work not yet approved by the Congress for construction. The 1955 construction program will provide for the completion of irrigation facilities to supply new and supplemental water supplies to an additional 307,000 acres and for an increased hydrogenerating capacity of 241,500 kilowatts.

The year was highlighted by completion of Canyon Ferry Dam, a large concrete dam on the Missouri River in Montana, and by the placing in service of its 50,000 kilowatt powerplant; by completion of Jamestown Dam, an earth dam in North Dakota, nearly a year ahead of schedule; by the addition of 104,750 kilowatts of power capacity on the Colorado-Big Thompson project in Colorado through the completion of the Flatiron power and pumping plant and Pole Hill powerplant; by "holing through" of the 4.5-mile long Eklutna Tunnel, a major feature of the Eklutna project in Alaska; and by placing in full service of the Hungry Horse powerplant in Montana, an important unit in the multiple-purpose development of the water resources of the Columbia River and its tributaries. Other notable accomplishments included the completion of Trenton Dam and Bartley Diversion Dam, both on the Missouri River Basin project in Nebraska, and the construction of irrigation facilities to serve about 55,000 acres of land on the Columbia Basin project in Washington.

CONTRACT AWARDS

Listed in table 1 are major construction and supply contracts (more than $1 million) awarded by the Bureau of Reclamation in fiscal year 1954. Among the features for which contracts were awarded were Monticello Dam on the Solano project in California, Wanship Dam on the Weber Basin project in Utah, the Chandler power and pumping plant on the Yakima project in Washington, and 108 miles of pipelines for the Delano-Earlimart irrigation district on the Central Valley project in California.

TABLE 1.—*Major Bureau of Reclamation contracts awarded in fiscal year 1954*

Feature	Project	Amount of award
Monticello Dam	Solano	$7,628,991
Completion of Webster Dam	Missouri River Basin	6,148,684
19 miles of pipelines for Davis aqueduct	Weber Basin	3,902,977
Steel towers for 204 miles of Big Bend-Granite Falls 230-kilovolt transmission line.	Missouri River Basin	2,626,913
57.4 miles of pipelines for unit 1, Delano-Earlimart irrigation district, Friant-Kern Canal.	Central Valley	2,606,538
Wanship Dam	Weber Basin	2,423,004
51.4 miles of pipelines for unit 3, Delano-Earlimart irrigation district, Friant-Kern Canal.	Central Valley	2,298,483
Chandler power and pumping plant	Yakima	1,957,713
Constructing foundations and erecting steel towers for 204 miles of Big Bend-Granite Falls 230-kilovolt transmission line.	Missouri River Basin	1,930,516
127 miles of laterals, sublaterals, wasteways, and drains, and 5 miles of pipelines for East low canal laterals.	Columbia Basin	1,676,547
Camino Tunnel and conduit	Central Valley	1,398,418
69.4 miles of laterals, sublaterals, and wasteways and 5.5 miles of pipelines, Potholes East Canal.	Columbia Basin	1,383,097
36.2 miles of Cambridge Canal, laterals, sublaterals, and drains	Missouri River Basin	1,224,616
24 miles of laterals and 5.1 miles of pipelines for Potholes East Canal.	Columbia Basin	1,063,159

Principal features completed on Bureau of Reclamation projects in fiscal year 1954 are shown in table 2. The listing includes 5 storage dams, 2 diversion dams, 4 powerplants in full production, 704 miles of canals, pipelines, and laterals, 102 miles of transmission lines, and 9.6 miles of railroad relocation.

TABLE 2.—*Principal features completed on Bureau of Reclamation Projects in fiscal year 1954*

Feature	Project	State
Canyon Ferry Dam and powerplant	Missouri River Basin	Montana.
Jamestown Dam	do	North Dakota.
Trenton Dam	do	Nebraska.
Bartley Diversion Dam	do	Do.
Webster Dam foundation	do	Kansas.
92 miles Angostura Canal, laterals, and drains	do	South Dakota.
82 miles transmission lines	do	Do.
33 miles canals for Bostwick division	do	Nebraska-Kansas.
36 miles laterals for Cambridge Canal	do	Nebraska.
9.6 miles railroad relocation at Kirwin Dam	do	Kansas.
Fort Clark pumping plant	do	North Dakota.
0.38-mile-long Tosten Tunnel	do	Montana.

TABLE 2.—*Principal features completed on Bureau of Reclamation Projects in fiscal year 1954*—Continued

Feature	Project	State
Flatiron power and pumping plant and Afterbay Dam.	Colorado-Big Thompson	Colorado.
Pole Hill powerplant	do	Do.
Willow Creek pumping plant	do	Do.
8.4 miles St. Vrain supply canal	do	Do.
2 miles Willow Creek pump canal	do	Do.
2.6 miles penstocks for Pole Hill and Flatiron powerplants.	do	Do.
Hungry Horse powerplant	Hungry Horse	Montana.
23 miles main canals	Columbia Basin	Washington.
279 miles laterals	do	Do.
14.5 miles pipelines	do	Do.
46 miles pipelines	Cachuma	California.
Camp Creek diversion dam	Central Valley	Do.
0.55-mile-long Camp Creek Tunnel	do	Do.
82 miles laterals for Madera Canal distribution system.	do	Do.
20 miles Folsom-Elverta transmission line	do	Do.
29 miles laterals for Mohawk Canal distribution system.	Gila	Arizona.
21 miles pipelines for Coachella Valley distribution system.	All-American Canal	California.
31 miles pipelines for San Jacinto-San Vicente aqueduct.	San Diego	Do.
7 miles Means and Eden Canals	Eden	Wyoming.
Picacho Arroyo North Branch Dam	Rio Grande	New Mexico.
Picacho South Dam	do	Do.
Rehabilitation of Vermejo project dams	Vermejo	Do.
Channelization 8.7 miles Rio Grande	Middle Rio Grande	Do.

PROGRESS OF CONSTRUCTION

On the Columbia Basin project in Washington construction proceeded on the irrigation systems which will serve large blocks of land from completed main canals. Irrigation facilities, including 25 small pumping plants, were completed during the year to provide water to about 186,000 acres of land.

Hungry Horse project construction in Montana was highlighted by the placing in service of the remaining two of four 71,250-kilowatt generators in the Hungry Horse powerplant, bringing the plant to its full capacity of 285,000 kilowatts. Also in Montana, Canyon Ferry Dam and its 50,000-kilowatt powerplant, features of the Missouri River Basin project, were completed, the plant being placed in full service by April 1954.

In Idaho, good progress was made in the construction of the Palisades Dam, largest of the Bureau's earth dams, and its associated 114,000-kilowatt powerplant.

Despite construction difficulties caused by repeated flooding of the contractor's cofferdams, the rehabilitation of the Savage Rapids Dam on the Grants Pass project in Oregon, wa essentially completed to allow 1954 irrigation operations to proceed on schedule.

On the Central Valley project in California the Camp Creek diversion dam was completed and construction continued rapidly on the extension of the irrigation distribution systems under the Friant-Kern and Madera Canals. Laterals totaling 82 miles in length were completed on the Madera system and construction of laterals on the extensive Delano-Earlimart irrigation district under the Friant-Kern Canal were brought to new high levels of completion by year's end. Nimbus Dam neared completion by the end of the year, and construction was continued on the project's Nimbus and Folsom powerplants.

Cachuma project construction in California was noted by completion of 46 miles of pipelines for the project's irrigation systems. On the project's Tecolote Tunnel the Bureau was faced with one of the most difficult construction problems it had encountered in recent years. Water temperatures of 112° and humidity of 100 percent at the working face stopped excavation of the remaining 4,700 feet of the 6-mile-long tunnel. At year's end installation of new pumping and dehumidifying facilities was under way, with the expectation that excavation of the tunnel could proceed without further delays.

In southern California, 21 miles of pipelines were completed on the irrigation lateral systems of the Coachella Valley distribution system of the All-American Canal system. Also in southern California, laying of the 61-mile-long second barrel of the San Jacinto-San Vicente aqueduct on the San Diego project was virtually completed at year's end.

In Arizona, on the Gila project, 29 miles of irrigation laterals of the Mohawk distribution system were completed, and the Dome Canal and the first unit of the Dome distribution system were virtually finished.

All existing contracts for channelizing of the Rio Grande on the Middle Rio Grande project in New Mexico were completed during the year and rehabilitation of 140 miles of drains approached completion by the end of the fiscal year. Good progress was made during the year on the rehabilitation of dams, canals, and laterals on the Vermejo project, also in New Mexico.

On the Weber Basin project in Utah, the 3-mile-long Gateway Tunnel was "holed through" in March 1954. Wanship Dam and the Davis aqueduct on the project were placed under construction.

In addition to completion of Canyon Ferry Dam and powerplant, construction on the Missouri River Basin project was notable for the completion of Jamestown Dam in North Dakota, and Trenton Dam and Bartley diversion dam in Nebraska. Also completed on the project were 30 miles of the Angostura Canal and 62 miles of laterals and drains in South Dakota; 33 miles of canals in Nebraska and Kansas; and 36 miles of irrigation laterals under the Cambridge Canal in Nebraska. In Kansas, the 9.6-mile-long railroad relocation at Kirwin Dam was completed, and construction began on the main embankment of Webster Dam, following completion of the dam's foundation earlier in the year.

Progress was made on the large network of electrical transmission lines which will transmit energy from powerplants of the Bureau of Reclamation and Corps of Engineers on the Missouri River Basin project. During the year 82 miles of transmission lines were completed and an additional 510 miles of lines were under construction. In May 1954, a contract was awarded for an additional 204 miles of lines. Associated with these transmission lines was the virtual completion of construction on 20 substations.

On the Colorado-Big Thompson project in Colorado, Willow Creek pumping plant on the western slope of this transmountain diversion development was completed. On the eastern slope the Pole Hill powerplant and Flatiron power and pumping plant (total capacity of 104,750 kilowatts) were placed in service on the project. Also finished was the 9-mile-long St. Vrain supply canal. With completion of these major facilities, the $160 million project, on which construction was begun in 1938, was essentially finished to give full service to water and power users.

Alcova powerplant (36,000 kilowatts) on the Kendrick project in Wyoming was brought to near completion at the end of June 1954.

In Alaska, on the Eklutna project, the 4.5-mile-long Eklutna Tunnel was essentially completed at the end of the fiscal year. Construction on the project's 30,000-kilowatt Eklutna powerplant and Anchorage substation continued.

The Bureau continued its efforts to develop and administer its safety program for the protection of personnel against occupational hazards. While there was a slight decrease in the number of accidents, the significant importance was the progress made in reducing the severity of occupational injuries. In construction operations the severity rate was reduced 59 percent below the 1953 rate.

DESIGN ACTIVITIES AND DEVELOPMENTS

The design engineering force experienced sharp staffing reductions during the year, but the Bureau continued to meet the pressures of design work. The Denver engineering offices completed designs and specifications for 124 major construction contracts. The average cost for these engineering services as related to the overall Bureau construction and rehabilitation program for fiscal year 1954 was 3.8 percent.

Progressive developments were made in dams design. For concrete arch dams the use of increased limiting stress in design, made possible through research and improved practices in control of concrete production, will permit the reduction of 20 percent of the total yardage of mass concrete, a substantial savings in construction costs.

Use in design of steel frames, insulated metal wall panels, and metal roof decking for power and pumping plant superstructures resulted in reduction of construction costs, and accelerated the initial operation of the plants. The use of rivets for shop fabrication and field erection of steel structures was virtually eliminated in design—all fabrication and erection is now done by welding, a significant factor in reducing construction costs. To effect further reductions in design and construction costs, power and pumping plant superstructures under design were replaced by the semiopen or outdoor type of building, and the expensive gantry-type crane replaced by a bridge-type crane.

Further economies were achieved by the standardization of design of steel towers for electrical transmission lines. During the year the price of aluminum was reduced, and as the supply became plentiful aluminum pipe was incorporated in the design of buses for electrical power and transmission systems. This has resulted in a significant saving in the cost of bus construction.

A highlight of the year was the confirmation of design of the Bureau's reversible pump turbine in the Flatiron power and pumping plant on the Colorado-Big Thompson project. Hydraulic acceptance tests of the unit indicated that warranted efficiency and capacity were exceeded by substantial margins. The Flatiron installation is the first of its kind in the United States. It is used both in pumping water for irrigation and for generation of power during periods of maximum kilowatt demand.

SPECIFICATION REQUIREMENTS

Revisions of specifications requirements were made during the fiscal year leading to improved administrative procedures and performance in construction by contractors engaged in reclamation work. To achieve greater uniformity in Government contract procedure, the Bureau initiated the use of the new standard Government forms for construction contracts. As assistance to both bidder and Bureau engineers, a copy of the construction contract form is now incorporated in each copy of the specifications issued by the Bureau.

Where indemnity bonds are required for work on the right-of-way of railroads or the right-of-way of other utilities, a new practice begun during the fiscal year requires that construction specifications contain a description of the types and amounts of the bonds required. This indemnity information is of considerable assistance to bidders in that they are informed of the bond requirements before bidding.

To provide for a more equitable allowance in the contractor's negotiation for contract adjustments, the Bureau's 10 percent maximum allowance for overhead, superintendence, general expense, and profit was changed to 15 percent. This new allowance is in consonance with present-day costs of doing business and parallels amounts currently allowed by other contracting agencies.

Throughout the fiscal year good competition was experienced under Bureau construction specifications and invitations for equipment and materials. Low bids received were generally near or below the engineers' estimates. European manufacturers continued to bid on Bureau equipment and materials requirements including firms in Switzerland, Italy, Austria, and France. In accordance with the "Buy American Act," a 25 percent differential was added to all foreign bids before they were compared with domestic bids.

RESEARCH ACTIVITIES

During the fiscal year the Bureau's engineering laboratories in Denver assisted in the solution of a wide variety of complex problems intrinsic in the development of reclamation structures and in their operation and maintenance.

In concrete materials investigations the laboratories developed a material having air-entraining, retarding, and plasticizing properties which shows promise of permitting a substantial reduction in the water requirements of mass concrete. An accelerated test was also developed to determine the relative resistance of concrete to disintegration due to attack by sulfates in soil and water.

A meter device, developed by a Bureau field engineer for measuring the inplace density of fresh concrete, was evaluated.

Also developed was an electronic device for rapidly scanning a photograph of concrete surfaces; hardened concrete can thus be analyzed for air content and for void size, spacing, and distribution.

The laboratories gave technical assistance during a hearing before the Interstate Commerce Commission on freight rates for fly ash. The hearing resulted in the granting of a low transcontinental rate for fly ash and an immediate saving to the Government of $13,000 in concrete construction at the Bureau's Palisades Dam, and possible savings amounting to many more thousands of dollars on mass concrete dams that may be built by the Bureau in the future.

Several hydraulic devices were developed or improved for use in the field. For Platoro Dam, a reservoir headgate, cooperatively designed with project personnel, was fabricated in the laboratories.

The tidal current meter used the past two irrigation seasons for measuring flow through the Walnut Grove Channel on the Central Valley project, was improved and readied for use this year.

Hydraulic tests of a modified lower cylinder gate on one of the four Hoover Dam intake towers demonstrated changes made in its bottom shape were adequate in reducing extreme vibration during emergency closure of the gate. Reworking of the gate also caused a marked reduction in the downpull for emergency closure. The test results justify similar modifications to the lower gates in the remaining three towers.

Siphon inlets on the Gateway Canal in the Weber Basin project, Utah were designed to have sloping baffles and thus prevent animals and humans falling in the canal from being swept into the siphons. Model tests indicated, however, that two large vortexes were as hazardous as the unguarded siphons. Modifications in the design were recommended to make the safety devices operate in a desirable manner.

One bay of the fish screen structure on the Delta-Mendota Canal headworks, Central Valley project, was equipped with a louver-type fish screen which showed promise of effectively preventing passage of fish into the canal. The louver-type screen is expected to reduce operation and maintenance costs and to lower the high fish mortality rate now occurring when revolving screens are used.

A total of 175 laboratory reports covering such fields of research as testing of concrete and concrete materials, earth and foundation materials, hydraulic studies, bituminous construction, structural studies and petrographic examinations were issued during the year.

WORK PERFORMED FOR OTHER AGENCIES

The Bureau's engineering skills and services were continued to be made available to other Federal agencies and foreign Governments. During the year 27 engineers were loaned to other Government agencies to assist in specialized work or to meet emergencies.

Technical studies were made in the design of a proposed pipeline for the city of Las Vegas, Nev. Analyses of multiple correlation problems arising in the forecasting of seasonal runoffs were made for the upper Colorado River Commission.

Laboratory assistance in the solution of several operation problems at Falcon Dam was given to the International Boundary and Water Commission. Hydraulic model studies on the proposed Gorge High Dam were conducted in the laboratories for the city of Seattle. A cooperative test program with the Atomic Energy Commission to determine the effects of radiation on asphalt materials was carried out in the laboratories during the year.

Advice and information relative to installation of various bituminous-type canal linings were made available to the Bureau of Indian Affairs.

INTERNATIONAL COOPERATION

Technical services by the Bureau, embracing preparation of designs and estimates for several major foreign projects, were performed for foreign Governments. These projects included: Snowy Mountains hydroelectric project, Australia; Klang Gates project, Malaya; Karadj Dam, Iran; Wu Sheh Dam, Formosa; Litani project, Lebanon; and Yan Hee project, Thailand. For the Australian, Thailand, and Formosan projects, engineers from these countries received training in Bureau design and construction practices and assisted in the preparation of designs.

CONSTRUCTION COSTS

Although construction wage rates increased about 6 percent, and material costs remained fairly steady, Bureau of Reclamation construction costs during fiscal year 1954 showed little or no variation from costs experienced during the previous fiscal year. This paralleled a nationwide trend on all types of public works, evidently the result of stiff competition in the construction industry. Many low bids were received well below carefully prepared estimates reflecting known labor, materials, and equipment costs. It can only be concluded that the low bidder's margin of profit is extremely slim, and that little or no amount is included in many of the bids for risk or contingencies.

Bidding interest in all types of Reclamation work continued to rise during the year. During the first half of the year, an average of 7 bids was received on construction specifications schedules issued by the Bureau, which amount was similar to the bidding interest shown during the last half of the previous fiscal year. However, the average number of bids per construction schedule rose to 8.8 for the second half of fiscal year 1954. This increased competitive interest was reflected by favorable prices and resulted in substantial savings to the Government.

The following table shows cost indexes for Bureau of Reclamation construction work based on the combined costs of materials and labor supplied by contractors and materials and labor supplied by the Government.

TABLE 3.—*Bureau of Reclamation construction cost indexes, fiscal year 1954*

Cost indexes based on January 1940 costs=$1	July 1953	January 1954	June 1954
Dams:			
Earth	$2.20	$2.20	$2.10
Concrete	2.30	2.20	2.15
Pumping plants:			
Building and equipment	2.45	2.55	2.55
Structures and improvements [1]	2.70	2.75	2.75
Equipment	2.25	2.35	2.35
Pumps and prime movers	2.30	2.40	2.45
Accessory electric and miscellaneous equipment	2.15	2.20	2.25
Discharge pipes	2.70	2.85	2.80
Canals and conduits:			
Canals	2.45	2.45	2.40
Conduits (tunnels, free flow, concrete lined)	2.55	2.60	2.55
Laterals and drains	2.90	2.75	2.70
Powerplants, hydro:			
Building and equipment	2.40	2.45	2.45
Structures and improvements [1]	2.70	2.70	2.70
Equipment	2.30	2.35	2.35
Turbines and generators	2.30	2.35	2.40
Accessory electrical equipment	2.20	2.25	2.25
Miscellaneous equipment	2.25	2.30	2.30
Penstocks	2.70	2.85	2.80
Transmission switchyards and substations	2.40	2.55	2.55
Transmission lines (wood pole 115 kilovolts)	2.20	2.15	2.10
Transmission lines (steel tower 230 kilovolts)	2.25	2.25	2.25
Permanent general property: Buildings	2.60	2.60	2.60
Roads and bridges:			
Primary roads	2.50	2.35	2.30
Secondary roads, unsurfaced	2.25	2.10	2.05
Bridges (steel)	2.70	2.75	2.75
Composite index	2.45	2.40	2.35

[1] Indexes for structures and improvements on pumping plants and powerplants are based on reinforced concrete structures.

DRAINAGE AND GROUND-WATER PROBLEMS

The Bureau's drainage and ground-water program encompasses activities from the earliest planning stages of a project, through construction, and constantly thereafter in project operation. Drainage is requisite to preservation of productivity of irrigated lands.

Significant progress was made during the fiscal year, both in the development or appraisal of practical new techniques and in the design, construction, and rehabilitation of drainage works. For the first time in Bureau history, all planning reports now submitted fully recognize and evaluate drainage requirements and costs.

Basic drainage policy was reviewed and strengthened. An innovation was the development of a policy under which the Bureau is planning to construct, at least on two major projects, closely spaced tile drains as a federally financed feature. Formerly such drains were considered the responsibility of the farmers; if the drains were not installed the lands deteriorated. On these two projects the water users could not finance farm drain construction. The new policy makes possible the construction of some additional feasible projects.

Ground-water problems which developed on the Columbia Basin project prompted clarification of important aspects of Bureau policy. The policy now clearly recognizes a limited Bureau responsibility for damages caused as the direct result of project operations, but does not assume responsibility resulting from irrigation of individual farms. Clarification of the Columbia Basin problem will materially assist in planning other projects.

Prompted by drought conditions, the Bureau was active during the year in ground-water explorations, in designing and developing wells for domestic water supply, in experimental wells for irrigation, and in projects where water salvage by irrigation or drainage wells is an important feature of the project plan. The entire irrigation water supply comes from ground water for some projects under construction. In the plan for a complex project in California, careful development of the ground-water resource along with the surface supply will provide control for the water table which, without such development, would be a serious and costly drainage problem.

The design and construction of drainage and ground-water facilities increased substantially as many projects undertook construction of these facilities. Drainage work on the Riverton project proceeded satisfactorily, although construction difficulties were experienced and special equipment and special provisions in contracts were necessary.

PUBLICATIONS

The third edition of Dams and Control Works and a revised reprint of the Paint Manual were published during this year. The first publication, written to be of interest to the nontechnical reader as well as to the engineer, describes the Bureau's experience in the design and construction of storage and diversion dams, spillways, and outlet works, and discusses the scope of reclamation engineering. The Paint Manual provides information and instructions relating to painting practices, paints, and to other types of protective coatings, as applied to Bureau work.

Also published during the year was the technical record on the design and construction of Bonny Dam, a large earth dam on the Missouri River Basin project in Colorado. The comprehensive technical record of Davis Dam design and construction was submitted for printing by the Government Printing Office. Technical records for Platoro Dam and three major features of the Columbia Basin project were essentially completed at year's end. Other technical records on which major work was done and which were scheduled for issuance in the next fiscal year were those for Anderson Ranch Dam, Hungry Horse Dam, and the Tracy pumping plant, and two volumes of the four-volume report on the Colorado-Big Thompson project.

The sixth edition of the Bureau's Concrete Manual was prepared and is to be published early in the next fiscal year. The manual is an authoritative handbook of information and instruction on concrete control and construction techniques.

Three engineering monographs were published during the year. These describe the Bureau's design criteria for concrete gravity and arch dams, the selection of hydraulic reaction turbines, and surge control on the Coachella pipe distribution system. Two technical memoranda were published covering the subjects of compression characteristics of rolled fill materials in earth dams and pressure grouting in large dam construction.

Other publications issued during the fiscal year included a revised edition of the pamphlet on labor relations in reclamation construction, a handbook on the Bureau's safety requirements for construction by contract, and a brochure describing the Bureau's Denver engineering laboratories.

In addition, 175 laboratory reports and 20 detailed instructions for operating irrigation and power systems were issued, along with 204 construction and supply specifications.

In conjunction with the engineering assistance accorded to other governments, a number of reports were issued, notable among which were the voluminous report on the Litani River Basin development in Lebanon, an evaluation report on the Karadj project in Iran, and a report on the Wu Sheh power development in Taiwan. Other reports, such as the one on the Yan Hee development in Thailand, were in preparation at year's end.

FOREIGN ACTIVITIES

During fiscal year 1954, the Bureau of Reclamation continued to cooperate in the technical assistance programs of the United States Government primarily at the request of the Foreign Operations Administration which took over the work formerly performed by Technical Cooperation Administration and Mutual Security Agency.

The Foreign Activities Division is responsible for administering the Bureau's participation in these programs. This assistance consisted of the training of technicians from foreign lands, rendering service to observers and visitors, sending of individual specialists and missions of Bureau technicians to other countries, and the performing of technical services such as testing, research and design and specification review for foreign water resources development. Besides the work for the Foreign Operations Administration, the Bureau also handled a number of requests for assistance from the Department of

TABLE 4.—*Bureau of Reclamation storage dams, June 30, 1954*

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Arizona: Salt River	Bartlett	Verde	Concrete multiple-arch	[1] 179,500	287	1,063	182,000	1939
	Cave Creek [2]	Cave Creek	do	11,000	109	1,648	18,775	1923
	Horse Mesa	Salt	Concrete arch, powerplant	[1] 245,100	300	803	162,000	1927
	Mormon Flat	do	do	[1] 57,900	224	505	59,900	1925
	Roosevelt	do	Masonry arch-gravity, powerplant	[1] 1,398,000	280	1,125	355,800	1911
	Stewart Mountain	do	Concrete arch, powerplant	69,800	207	1,260	120,500	1930
Arizona-California: Parker-Davis	Parker [2]	Colorado	do	717,000	320	856	380,000	1938
Arizona-Nevada:								
Boulder Canyon	Hoover (Boulder)	do	Concrete arch-gravity, 2 powerplants	31,142,000	726	1,244	4,400,000	1936
Parker-Davis	Davis	do	Earth, powerplant	1,820,000	200	1,600	4,357,500	1950
California:								
Cachuma	Cachuma	Santa Ynez	Earth	232,000	275	2,975	6,600,000	1953
	Glen Anne	Offstream	do	500	102	240	121,000	1953
	Lauro	do	do	642	110	540	472,000	1952
Central Valley	Friant [2]	San Joaquin	Concrete gravity	521,000	319	3,488	2,135,000	1942
	Keswick [3]	Sacramento	do	23,800	159	1,046	197,000	1945
	Martinez	Offstream	Earth		38	1,200	183,450	1947
	Nimbus	American	Earth, concrete overflow section	7,600	76	1,093	205,000	(4)
	Shasta	Sacramento	Concrete curved-gravity, embankment wing, powerplant.	4,493,000	602	3,460	6,541,000	1945
	Sly Park	Sly Park Creek	Earth, rock	47,130	190	760	657,000	(4)
Orland	East Park	Little Stony Creek	Concrete arch-gravity	51,000	139	226	15,745	1910
	Stony Gorge	Stony Creek	Concrete slab-and-buttress	[1] 50,200	139	868	43,100	1928
Solano	Monticello	Putah Creek	Concrete arch	1,600,000	295	1,000	270,000	(4)
Colorado:								
Colorado-Big Thompson	Carter Lake	Offstream	Earth (2 dikes)	117,000	200	1,235	2,900,000	1952
	Dixon Canyon	do	Earth	(5)	240	1,215	3,004,000	1949
	Flatiron	do	do	19,000	70	1,730	364,500	1953
	Granby	Colorado	do	546,000	245	885	2,901,300	1950
	Green Mountain	Blue	Earth, powerplant	154,600	300	1,150	4,406,000	1943
	Horsetooth	Offstream	Earth	147,000	150	1,610	1,890,000	1949
	Marys Lake [3]	do	Earth (2 dikes), powerplant	700	40	1,300	60,500	1950
	Olympus [2]	Big Thompson	Concrete gravity, embankment wing	2,850	60	1,850	300,000	1949
	Rattlesnake	Offstream	Earth	2,000	105	1,080	408,000	1952
	Shadow Mountain	Colorado	do	15,000	44	600	210,000	1946
	Soldier Canyon	Offstream	do	(5)	220	1,420	3,288,000	1949
	Spring Canyon	do	do	(5)	215	1,115	2,213,000	1948
	Willow Creek	Willow Creek	do	11,150	135	1,075	384,000	1953
Fruitgrowers Dam	Fruitgrowers	Alfalfa Run	do	4,600	55	1,520	135,500	1938
Mancos	Jackson Gulch	Offstream	do	10,000	181	1,895	1,988,000	1948
Pine River	Vallecito	Pine	do	129,700	162	4,010	3,738,000	1947
Uncompahgre	Taylor Park	Taylor	do	[1] 106,200	206	675	1,115,100	1931
San Luis Valley	Platoro	Conejos	do	60,000	165	1,538	909,884	1952

Idaho: Minidoka	American Falls	Snake	Concrete gravity, embankment wings	[1] 1,700,000	94	5,227	313,600	1927
	Jackson Lake	do	do	[1] 847,000	70	4,920	491,700	1911
	Minidoka [2]	do	Earth with concrete, powerhouse section, powerplant.	[1] 95,200	86	4,475	257,300	1906
	Grassy Lake	Grassy Lake	Earth	15,200	118	1,170	541,600	1939
	Island Park	Snake, Henry's Fork	do	127,200	91	9,448	464,000	1938
Idaho-Oregon: Boise	Anderson Ranch	Boise, South Fork	Earth, powerplant	493,200	456	1,350	9,653,300	1950
	Arrowrock	Boise	Concrete arch-gravity	[1] 286,600	354	1,150	636,000	1915
	Cascade	Payette, North Fork	Earth	704,100	107	785	395,000	1948
	Deadwood	Deadwood	Concrete arch	[1] 161,900	165	749	56,400	1931
	Deer Flat, Upper	Offstream	Earth	190,100	74	4,000	1,245,000	1908
	Deer Flat, Lower	do	do		46	7,200	1,240,000	1908
	Deer Flat, Middle	do	do		16	950	22,500	1908
Idaho-Wyoming: Palisades	Palisades	South Fork, Snake River	do	1,400,000	260	2,100	13,571,000	(4)
Kansas: Smoky Hill division (Missouri River basin)	Cedar Bluff	Smoky Hill	do	368,100	204	11,000	8,917,000	1951
Kansas-Colorado:								
Solomon division (Missouri River basin).	Kirwin	North Fork, Solomon River.	do	315,000	170	12,600	9,180,000	(4)
	Webster	Solomon River	Earth, rock	(4)	108	10,600	5,500,000	(4)
St. Francis (Missouri River basin).	Bonny	South Fork, Republican River.	do	175,000	160	9,265	8,530,000	1951
Montana:								
Bitter Root	Como	Rock Creek	do	34,800	65	2,550	1,106,000	1910
Hungry Horse	Hungry Horse	Flathead, South Fork	Concrete arch-gravity, powerplant	3,468,000	564	2,115	3,086,200	1952
Huntley	Anita	Offstream	Earth	[1] 400	42	1,050	142,800	1937
Milk River	Fresno	Milk	do	129,100	111	2,070	2,105,000	1939
	Nelson	Offstream	Earth (5 dikes)	85,500	28	9,900	232,600	1915
	Sherburne Lakes	Swiftcurrent Creek	Earth	[1] 66,100	96	1,086	227,600	1921
Sun River	Gibson	Sun, North Fork	Concrete arch	[1] 105,000	196	960	167,500	1929
	Pishkun	Offstream	Earth (8 dikes)	46,400	50	9,180	599,300	1921
	Willow Creek	Willow Creek	Earth, semihydraulic fill	[1] 32,400	93	650	254,186	1911
Helena-Great Falls division (Missouri River basin).	Canyon Ferry	Missouri River	Concrete gravity	2,050,000	220	1,010	414,700	1954
Lower Marias division (Missouri River basin).	Tiber	Missouri River	Earth, rock	1,397,000	205	4,300	5,375,000	(4)
Nebraska:								
Frenchman-Cambridge division (Missouri River basin).	Enders	Frenchman Creek	Earth	74,000	134	2,603	1,951,000	1950
	Medicine Creek	Medicine Creek	do	93,000	180	5,630	2,883,000	1950
	Trenton	Republican	do	172,000	95	7,800	8,130,000	1954
Mirage Flats	Box Butte	Niobrara	do	31,300	87	5,508	1,422,000	1946
Nebraska-Wyoming: North Platte	Guernsey	North Platte	Earth, powerplant	48,100	135	560	586,200	1927
	Lake Alice, upper	Offstream	Earth	11,400	30	3,100	240,600	1913
	Lake Alice, lower	do	do		23	2,550	119,000	1912
	Minatare	do	do	[1] 60,800	63	3,700	696,100	1915
	Pathfinder	North Platte	Masonry arch-gravity	[1] 1,070,000	214	1,070	65,700	1909
	Pathfinder dike	do	Earth		38	1,650	152,200	1909
Nevada:								
Humboldt	Rye Patch	Humboldt	Earth	[1] 179,000	80	914	356,300	1936
Newlands	Lahontan	Garson	Earth, powerplant	[1] 273,600	162	5,400	733,100	1915
	Lake Tahoe [2]	Truckee	Concrete slab-and-buttress, lake outlet regulator.	[1] 732,000	16	109	430	1913

See footnotes at end of table.

TABLE 4.—*Bureau of Reclamation storage dams, June 30, 1954*—Continued

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Nevada-California: Truckee storage	Boca	Little Truckee	Earth	41, 200	116	1, 629	911, 900	1939
New Mexico:								
Carlsbad	Alamogordo	Pecos	Earth and rockfill	156, 800	148	3, 084	1, 914, 900	1937
	Avalon [2]	do	Earth	7, 000	58	1, 025	202, 300	1891
	McMillan	do	do	38, 700	57	2, 114	234, 000	1894
Rio Grande	Picacho South	Picacho Arroyo, South Branch.	do	[6] 400	29	1, 620	91, 000	1954
	Picacho North	Picacho Arroyo, North Branch.	do	[6] 565	45	1, 600	149, 000	1953
Vermejo	Dam No. 2	Offstream	do	2, 300	9	11, 800	162, 000	1954
	Dam No. 13	do	do	4, 800	15	8, 200	880, 000	1954
	Stubblefield (1 dike)	do	do	13, 000	50	15, 800	239, 000	1954
New Mexico-Texas: Rio Grande	Caballo [2]	Rio Grande	do	340, 850	112	4, 558	1, 244, 200	1938
	Elephant Butte	do	Concrete gravity, powerplant. (1940)	[1] 2, 185, 400	301	1, 674	629, 500	1916
North Dakota:								
Heart division (Missouri River Basin).	Heart Butte	Heart River	Earth	450, 000	174	1, 850	1, 222, 000	1949
	Dickinson	do	do	16, 500	69	2, 225	326, 000	1950
Missouri-Souris division (Missouri River Basin).	Jamestown	James	do	1, 460	100	1, 400	960, 000	1953
Oklahoma: W. C. Austin	Altus [2]	Red, North Fork	Concrete gravity, masonry-faced	[1] 151, 700	110	1, 112	70, 200	1945
Oregon:								
Baker	Thief Valley	Powder	Concrete slab-and-buttress	17, 400	70	390	6, 288	1932
Burnt River	Unity	Burnt	Earth, rock-faced	25, 800	83	675	253, 600	1938
Deschutes	Crane Prairie	Deschutes	Earth	55, 300	36	285	29, 700	1940
	Ochoco	Ochoco Creek	do	47, 500	125	1, 350	750, 000	[7] 1921
	Wickiup	Deschutes	do	187, 300	100	13, 860	1, 852, 000	1949
	Wickiup-East Dike	do	do		28	3, 420		1949
Umatilla	Cold Springs	Offstream	do	[1] 50, 000	117	3, 450	793, 400	1908
	McKay	McKay Creek	Earth, concrete-faced	[1] 73, 800	180	2, 700	2, 363, 800	1927
Vale	Agency Valley	Malheur, North Fork	Earth	59, 900	110	1, 850	645, 300	1935
	Warm Springs	Malheur, Middle Fork	Concrete arch	192, 400	106	469	19, 500	1919
Oregon-California: Klamath	Clear Lake	Lost	Earth	527, 000	39	840	63, 400	1910
	Gerber	Miller Creek	Concrete arch	[1] 94, 300	88	485	11, 900	1925
	Link River	Link	Concrete slab-and-buttress, lake outlet regulator.	[1] 873, 000	22	435	2, 200	1921
Oregon-Idaho: Owyhee	Owyhee [2]	Owyhee	Concrete arch-gravity	1, 120, 000	417	833	537, 500	1932
South Dakota:								
Cheyenne division (Missouri River Basin).	Angostura	Cheyenne	Concrete gravity, embankment wing	220, 000	187	1, 900	749, 600	1949
	Pactola	Rapid Creek	Earth, rock	99, 000	230	1, 340	2, 400, 000	(4)
Belle Fourche	Belle Fourche	Owl Creek	Earth, concrete-faced	[1] 177, 500	122	6, 262	1, 783, 200	1911
Rapid Valley	Deerfield	Castle Creek	Earth	15, 700	133	825	607, 400	1947
Grand division (Missouri River Basin).	Shadehill	Grand	do	467, 000	145	1, 900	3, 500, 000	1951
Texas: Colorado River	Marshall Ford	Colorado (Texas)	Concrete gravity, embankment wings, powerplant.	1, 951, 300	278	5, 093	3, 579, 000	1942

Utah:								
Hyrum	Hyrum [2]	Little Bear	Earth	18,800	116	540	435,600	1935
Moon Lake	Midview	Offstream	do	5.800	54	663	138,900	1937
	Moon Lake	Lake Fork, West Fork	do	[1] 35,800	110	1,108	513,100	1938
Newton	Newton	Clarkson Creek	do	5,500	101	4,781	410,000	1946
Ogden River	Pine View	Ogden	do	43,600	103	480	267.700	1937
Provo River	Deer Creek	Provo	do	152,600	235	1,304	2,827,900	1941
Scofield	Scofield	Price	do	73.000	125	575	202,700	1946
Strawberry Valley	Strawberry	Strawberry	do	283.000	79	488	117,900	1913
Weber River	Echo	Weber	do	73,900	158	1,887	1,539,800	1931
Washington:								
Columbia Basin	Grand Coulee	Columbia	Concrete gravity, 2 powerplants and pumping plant.	9,402,000	550	4,173	10.585,000	1942
	Dry Falls	Offstream	Earth	1,275,000	94	9,800	1,605,000	1949
	North	do	do		150	1,450	1,471,500	1951
	Long Lake	do	do	65,000	130	1,900	1,462,000	1948
	O'Sullivan	Lower Crab Creek	do	675,000	200	19,000	8,753,000	1949
Okanogan	Conconully	Salmon Creek	Earth, hydraulic fill	[1] 13,000	70	1,000	359,000	1910
	Salmon Lake	do	Earth	[1] 10,500	42	1,260	194,900	1921
Yakima	Bumping Lake	Bumping	do	[2] 33,700	45	3,660	252,600	1910
	Clear Creek	Tieton, North Fork	Concrete arch	[2] 5,300	80	404	5,800	1914
	Cle Elum	Cle Elum	Earth	436,900	135	750	1,411,300	1933
	Kachess	Kachess	do	[1] 239,000	114	1,400	199,600	1912
	Keechelus	Yakima	do	157,800	105	6,550	683,500	1917
	Tieton	Tieton	Earth, semihydraulic fill	[1] 198,000	235	920	2,048,600	1925
Wyoming:								
Boysen division (Missouri River Basin).	Boysen	Big Horn	Earth, powerplant	1,493,000	220	1,000	1,689,000	1952
Cheyenne division (Missouri River Basin).	Keyhole	Belle Fourche	Earth	510,000	165	3,420	1,300,000	1952
Eden	Big Sandy	Big Sandy Creek	do	65,000	80	2,300	840,000	1952
Kendrick	Alcova [2]	North Platte	do	190.700	265	763	1,635,300	1938
	Seminoe	do	Concrete arch, powerplant	[1] 1,026.000	295	530	210,200	1939
Oregon Trail division (Missouri River Basin).	Kortes [3]	North Platte	Concrete gravity, powerplant	4,800	240	440	147,000	1951
Riverton	Bull Lake	Bull Lake Creek	Earth	[1] 152,000	81	3,456	819,600	1938
	Pilot Butte	Offstream	Earth, semihydraulic fill	[1] 31,600	51	1,300	135,300	1926
Wyoming-Montana: Shoshone	Deaver	do	Earth	680	14	1,300	30,300	1918
	Ralston	do	do	1,500	35	2,200	24,700	1908
	Buffalo Bill	Shoshone	Concrete arch, powerplant	456.600	325	200	82,900	1910

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[1] Live storage—dead storage not evaluated.

[2] Storage and diversion.

[3] Power dam—water supply for generation of power.

[4] Under construction.

[5] Horsetooth Reservoir formed by 4 dams.

[6] For flood retention only.

[7] Rehabilitated by the Bureau of Reclamation in 1950.

DEFINITIONS

Capacity: Acre-feet of reservoir storage provided by highest controlled water surface.
Height: Feet between lowest point in foundation and normal crest of dam.
Length: Feet of barrier in dam and integral features constructed between natural abutments.

Volume: Cubic yards of all material in dam and its appurtenant features.
Year: Date original construction was completed. (Other tabular data include supplemental construction.)

TABLE 4A.—*Bureau of Reclamation diversion dams, June 30, 1954*

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Arizona: Salt River	Granite Reef	Salt	Concrete weir	3,600	18	1,128	35,000	1908
	Joint Head	do	Concrete weir, embankment wing	200	4	2,600	5,400	1914
	Power Canal	do	do	220	8	862	16,000	1906
Arizona-California:								
Gila and Boulder Canyon, All-American Canal system.	Imperial	Colorado	Concrete slab-and-buttress weir, desilting works.	17,160	23	3,475	196,790	1938
Yuma	Laguna	do	Rockfill weir, concrete-surfaced	1,950	10	4,780	486,800	1909
California:								
Orland	East Park Feed Canal	Stony Creek	Concrete arch, overflow	200	28	271	1,777	1914
	Northside	do	Concrete weir, removable crest	80	3	375	270	1913
	Southside	do	Concrete weir	140	3	895	3,600	1916
Central Valley	Camp Creek	Camp Creek	Concrete, overflow weir	500	20	[1] 43	3,000	1953
Colorado:								
Fruitgrowers Dam	Dry Creek	Dry Creek	Concrete weir	100	5	36	242	1940
Grand Valley	Grand Valley	Colorado	Concrete weir, movable crest	1,425	14	543	17,990	1916
Uncompahgre	East Canal	Uncompahgre	Concrete weir, embankment wing	330	8	764	1,009	1915
	Garnet	do	Rockfill weir, concrete-surfaced	50	4	75	500	(2)
	Gunnison	Gunnison	Timber-crib weir, concrete wings, removable crest.	1,000	10	244	3,200	1912
	Ironstone	Uncompahgre	Concrete gate-structure, timber-crib wing.	350	8	[1] 31	155	(2)
	Loutsenhizer	do	Timber weir	290	9	114	400	[2] 1883
	Montrose and Delta	do	Concrete gate-structure, movable crest	450	12	68	500	[2] 1883
	Selig	do	Timber weir, removable crest	300	10	96	500	(2)
Colorado-Big Thompson	North Poudre	Cache la Poudre	Concrete weir, embankment wing	250	18.5	200	8,700	1952
Idaho: Lewiston Orchards	Sweetwater	Sweetwater Creek	Rockfill weir, concrete diaphragm	77	8	80	400	1948
	Webb Creek	Webb Creek	do	20	10	75	600	1948
Idaho-Oregon: Boise	Black Canyon [3]	Payette	Concrete gravity, overflow, removable crest, powerplant.	1,360	111	1,039	81,204	1925
	Boise River	Boise	Concrete and masonry weir, removable crest, powerplant.	2,815	39	500	26,100	1908
Idaho-Wyoming: Minidoka	Cascade Creek	Cascade Creek	Timber-crib weir, removable crest	220	6	217	3,068	1937
	Cross Cut	Henry's Fork	Concrete weir	590	10	457	7,375	1937
Montana:								
Bitter Root	Rock Creek	Rock Creek	Timber-crib weir	320	6	30	150	[2] 1910
Frenchtown	Frenchtown	Missoula	Earth (includes 3 dikes), nonoverflow	170	13	489	12,176	1936
Huntley	Yellowstone River	Yellowstone	Concrete weir	400	8	250	1,674	1934
Milk River	Dodson	Milk	Timber-crib weir, removable crest, embankment wings.	1,450	22	8,154	87,355	1910
	Saint Mary	Saint Mary	Concrete weir	530	6	198	1,230	1915
	Swift Current	Swift Current Creek	Earth, timber-crib core, nonoverflow		13	4,800	98,400	1915
	Vandalia	Milk	Concrete slab-and-buttress weir, movable crest, embankment wing.	250	32	2,350	15,207	1917
Sun River	Sun River	Sun, North Fork	Concrete arch, overflow	1,400	114	261	6,466	1915
Montana-North Dakota: Lower Yellowstone.	Lower Yellowstone	Yellowstone	Timber-crib weir, embankment wings	840	4	800	22,500	1910

Nebraska:								
Bostwick division, Missouri River Basin.	Superior-Courtland	Republican	Concrete ogee weir, embankment wings.	169	21	8,075	178,000	1950
Mirage Flats	Dunlap	Niobrara	Concrete weir, embankment wing	220	6	577	5,100	1945
Frenchmen-Cambridge Missouri River Basin.	Cambridge	Republican	do	325	33	432	13,850	1948
	Bartley	do	do	130	35	1,015	58,000	1954
Nebraska-Wyoming: North Platte	Horse Creek	Horse Creek	do	430	6	720	5,260	1923
	Whalen	North Platte	do	3,700	11	2,460	81,700	1909
Nevada: Newlands	Carson River	Carson	Concrete gate-structure	1,950	14	241	2,707	1905
	Derby	Truckee	Concrete gate-structure, embankment wing.	1,500	15	1,331	36,572	1905
New Mexico-Texas: Rio Grande	American [4]	Rio Grande	Concrete weir, movable crest, embankment wings.	1,110	5	9,306	67,667	[2] 1938
	Leasburg	do	Concrete weir, embankment wing	600	6	2,865	22,500	1908
	Messilla	do	do	890	4	3,445	23,600	1916
	Percha	do	Concrete weir, movable crest, embankment wings.	350	9	2,720	43,238	1917
	Percha Arroyo	Percha Arroyo	Earth, nonoverflow	30,000	19	2,489	192,884	1939
	Riverside	Rio Grande	Concrete weir, movable crest, embankment wings.	1,000	6	3,370	145,150	1928
Fort Sumner	Fort Sumner	Pecos	Concrete weir	100	35	715	24,660	1951
Oregon:								
Deschutes	North Canal	Deschutes	Concrete arch-gravity, overflow	1,000	28	293	[5] 4,900	[2] 1912
Grants Pass	Savage Rapids	Rogue	Concrete, gravity and multiple arch	207	40	392	5,600	[2] [7] 1921
Umatilla	Feed Canal	Umatilla	Concrete weir, embankment wing	350	4	2,100	14,100	1907
	Maxwell	do	Concrete and timber-crib weir, embankment wing.	140	5	400	464	1915
	Three Mile Falls	do	Concrete multiple-arch, overflow	360	23	915	5,068	1914
Vale	Harper	Malheur	Concrete gate-structure, embankment wing.	660	21	914	9,258	1929
Oregon-California: Klamath	Lost River	Lost	Concrete multiple-arch, overflow, embankment wings.	1,200	26	675	19,915	1912
	Lower Lost River	do	Concrete slab-and-buttress	810	12	324	689	1921
	Malone	do	Concrete gate-structure, embankment wing.		18	515	24,600	1923
	Miller	Miller Creek	Concrete weir, removable crest, embankment wings.		5	290	1,615	1924
South Dakota: Belle Fourche	Belle Fourche	Belle Fourche	Concrete weir, embankment wing	1,635	18	2,523	35,700	1907
Utah:								
Hyrum	Hyrum	Little Bear, East Fork	Rockfill weir, embankment wing	90	1	520	2,900	1937
Moon Lake	Duchesne Feeder Canal.	Duchesne	Concrete weir, embankment wings	220	6	[1] 220	4,000	1939
Provo River	Murdock	Provo	Concrete weir, overflow, embankment wing.	5,000	10	100	9,036	1950
	Weber River	Weber	Concrete weir, embankment wings	1,000	10	1,795	15,400	1931
Strawberry Valley	Indian Creek Crossing.	Indian Creek	do	750	9	1,350	15,200	1913
	Spanish Fork	Spanish Fork	Concrete weir	500	13	74	1,300	1908

See footnotes at end of table.

TABLE 4A.—*Bureau of Reclamation diversion dams, June 30, 1954*—Continued

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Washington:								
Okanogan	Salmon Creek	Salmon Creek	Concrete weir, embankment wing	300	5	130	800	1909
Yakima	Easton [3]	Yakima	Concrete gravity, overflow, movable crest.	1,320	51	248	5,760	1929
	Prosser [6]	do	Concrete weir	(6)	6	768	1,026	[2] 1904
	Roza	do	Concrete weir, movable crest	2,200	34	486	21,711	1939
	Sunnyside	do	Concrete weir, embankment wing	1,320	6	[1] 500	1,809	1907
	Tieton	Tieton	do	320	2	510	1,368	1908
Wyoming:								
Riverton	Wind River	Wind River	do	2,200	19	2,464	123,860	1923
Shoshone	Corbett	Shoshone	Concrete slab-and-buttress weir, embankment wing.	1,000	12	938	10,200	1908
	Willwood	do	Concrete gravity, overflow, embankment wing.	320	41	476	22,119	1924

[1] Overflow—length of overflow section only.

[2] Non reclamation construction.

[3] Storage and diversion—dam classified according to its principal feature.

[4] Contributory dam—nonreclamation, furnishing water supply or power for irrigation of Bureau of Reclamation projects.

[5] Dam—indicates data applicable to dam only.

[6] Power dam—water supply for generation of power.

[7] Rehabilitated by the Bureau of Reclamation in 1953.

DEFINITIONS

Capacity: Second-feet of diversion provided by canal headworks at dam.

Height: Feet between original streambed and highest controlled water surface.

Length: Feet of barrier in dam and integral features constructed between natural abutments.

Volume: Cubic yards of all material in dam and its appurtenant features.

Year: Date original construction was completed.

State, UNRWA, IBRD, and other agencies directly concerned with water resources development throughout the world. The Department of State requests were under the authority of Public Law 402 and financed by funds made available by requesting government.

The Training Administration Branch handled 135 inservice trainees during fiscal year 1954, which included engineers and government officials from 24 different countries. Also accommodated were 20 official observers from 15 different countries and 102 accredited visitors from 26 countries. No records are kept of the numerous foreign visitors who stop unannounced at Bureau installations but who are usually given the same courteous reception accorded the programed persons. In the Denver office alone, 131 persons from 41 countries visited the Bureau's facilities as tourists during the past fiscal year.

Among some of the outstanding visitors to reclamation projects during the year were Ambassador Mehta of India; Carl A. Bock, director, Puerto Rico Water Resources Authority; A. N. Khosla, past chairman, Central Water and Power Commission, India; Abdullah Khan, president, Helmand Valley Authority, Afghanistan; Comdr. Robert G. A. Jackson, head, Volta River Preparatory Commission, Gold Coast; Andre Coyne, engineering consultant, France; Emperor Haile Selassie, Ethiopia; and W. H. Hudson, commissioner, Snowy Mountains Hydro-Electric Authority, Australia.

Through the Technical Cooperation Branch, under the FOA program, 121 Bureau employees were on technical assistance assignments of various types during fiscal year 1954 in Afghanistan, Chile, Colombia, Costa Rica, Egypt, Ethiopia, Formosa, India, Iran, Iraq, Israel, Jordan, Lebanon, Libya, Nicaragua, Pakistan, Philippines, Turkey, and Uruguay. In addition, 13 men were sent on technical assistance missions for other agencies, including a 7-man team to advise the Thailand Government on its Yan Hee project.

Towards the close of the fiscal year, a new agreement was signed between the Department of Interior and Foreign Operations Administration, establishing new procedure for handling technical assistance. This new agreement has not as yet been implemented and its effect on future Bureau participation in the foreign assistance program is unknown.

During the year the Bureau received $2,329,000 from other agencies to finance these technical assistance endeavors. This may be compared with $2,438,000 for fiscal year 1953 and $1,845,000 for fiscal year 1952.

Engineering services available in the Denver office continued to be in demand during the past year. Under the authority of Public Law 402, and at the request of Foreign Operations Administration, work was accomplished for the Snowy Mountains Hydro-Electric Authority, Australia; Wu Sheh project, Formosa; Klang Gates Dam, Malaya; Kardj Dam, Iran; Litani River project, Lebanon; city of Singapore, Malaya; Electric Power Development, Inc., Japan; Peruvian School of Engineering; Greater Vancouver Water District, Canada; Central Water and Power Commission, India; Sariyar project, Turkey; Taunsa Barrage project, Pakistan; Damodar Valley corp., India; Rio Elqui project, Chile; and Chao Phya project, Thailand.

IRRIGATION DIVISION

The Irrigation Division, formerly the Operations and Maintenance Division, is responsible for keeping irrigation water flowing down the ditch to 125,000 family-sized farms and a like number of urban and suburban units consisting of more than 7,000,000 acres on which 410,000 settlers live. This land, supplied with water from Bureau constructed works, is about one-fourth of the total irrigated land area in the Western States.

Actually, the reclamation family proper, exclusive of the municipal and industrial water benefactors, numbers almost 2,000,000.

In addition to the settlers living on the projects, at least 1,500,000 persons living in nearby towns and villages are dependent on the reclamation program.

In addition to supplying irrigation water, Bureau of Reclamation constructed works provide municipal and industrial water service to over 2,000,000 people. The Irrigation Division is also responsible for keeping these water delivery facilities on 69 projects in good repair to assure the best and most economical use of water. These facilities include 126 storage and 80 division dams, more than 19,500 miles of canals and laterals, more than 5,700 miles of drains, 386 major pumping plants, and an estimated 11,300 miles of operating roads.

Extension of Irrigation Service

The 1953 total of irrigable land in the service area of reclamation projects reached 7,147,528 acres. This is an increase of 153,050 irrigable acres over the 6,994,478 acres reported in 1952. The extension of irrigation service on the Columbia Basin project, Washington, and the Central Valley project in California accounts for approximately 74 percent of the total increase. Other significant increases occurred on the Coachella and Imperial divisions of the Boulder Canyon project, California; the Frenchman-Cambridge unit, Nebraska; Missouri River Basin project; Gila project, Arizona; and the Klamath project, Oregon-California.

A total of 368 full-time and 21 part-time farm units was made available from Federal lands. Veterans were given preference under the provisions of various preference acts for 256 units on the Columbia Basin project, 85 units on the Minidoka, 28 units on the Gila, and 20 units on the Coachella division of the Boulder Canyon project. Of the 21 part-time units 6 were available to applicants not entitled to veterans' preference.

Crop Production

The 1953 harvest of crops in the service area of Federal reclamation projects was valued at $785,939,868. This was the eighth consecutive year of crop values in excess of the one-half billion dollar mark, and brought the cumulative value of all reclamation harvests through 1953 to more than $9.7 billion. The value of the crop was the third highest in reclamation history. However, it was $149.7 million less than the record value of $935.7 million produced in 1952. The decline in total value of crops was due primarily to lower unit prices received by the irrigation farmers. Tonnagewise, the 1953 harvest was the highest on record. The total tonnage produced, 25.7 million tons, was 2.1 millon tons or 9 percent greater than 1952 harvest, and approximately 80 percent larger than the harvest of 10 years ago.

The $126.92 average crop value per acre of cultivated land reflects a decline of $28.34 from the record per acre value attained in 1952 of $155.26. The high average value per acre for all production on a major division was $687.32 attained on the Tieton division of the Yakima project, Washington. Fruits and nuts were highest in value per acre ($423.46) and hay and forage were lowest ($37.83).

The 1953 harvest of 25,711,235 tons included: 11,814,510 tons (46 percent) of hay, pasture and forage crops; 6,872,171 tons (26.7 percent) of miscellaneous field crops; 3,722,819 tons (14.5 percent) of vegetable and truck crops; 1,677,704 tons (6.5 percent) of cereal crops; 1,513,391 tons (5.9 percent) of fruits and nuts; and 110,640 tons (0.4 percent) of various seed crops. In terms of acres, the most significant crop group was hay and forage with 44.6 percent of the irrigated lands producing these crops. The effective use of the forage on the 700 million acres of rangeland in the Western States is greatly enhanced by the supplementary feed and forage crops produced on irrigated farms.

The most significant individual crop produced in 1953 was cotton which made up approximately 21 percent of the total crop value and utilized about 11 percent of the irrigated land. Alfalfa hay was the second most significant crop with 11 percent of the value and 22 percent of the acreage. The acreage and value of crops produced on each of the Federal reclamation projects is shown in tables 5 and 6.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1953*

State, project, and subdivision	Full supply projects constructed or rehabilitated by the Bureau								Supplemental supply projects constructed or rehabilitated by the Bureau				
	Irrigable area for service [1]	Irrigated area	Land subject to construction charges			Temporarily suspended land [2]			Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
			Net area in cultivation	Gross crop value		Net area in cultivation	Gross crop value	Value per acre				Total	Per acre
				Total	Per acre								
REGION 1													
Idaho													
	Acres	*Acres*	*Acres*			*Acres*			*Acres*	*Acres*	*Acres*		
Lewiston Orchards [3]	3, 524	2, 231	2, 234	$576, 399	$258. 01								
Idaho-Oregon													
Boise:													
Big Bend irrigation district (Oregon)	1, 724	1, 463	1, 463	74, 991	51. 26								
Black Canyon irrigation district, unit 1	6, 880	6, 437	6, 610	725, 183	109. 71								
Black Canyon irrigation district, unit 2	51, 702	45, 617	45, 917	2, 509, 153	54. 65								
Boise-Kuna irrigation district	48, 660	45, 256	45, 256	3, 163, 004	69. 89								
Nampa and Meridian irrigation district	40, 196	34, 819	34, 860	2, 300, 746	66. 00								
New York irrigation district	17, 826	14, 343	14, 343	557, 530	38. 87								
Settlers irrigation district	518												
Wilder irrigation district	56, 558	50, 649	50, 651	5, 886, 298	116. 21								
Special and Warren Act contractors													
Total, Boise project	224, 064	198, 584	199, 100	15, 216, 905	76. 43								
Idaho-Washington													
Rathdrum Prairie:													
Hayden Lake Unit [3]	1, 087	619	619	50, 276	81. 22								
Post Falls Unit [3,4]	3, 109	2, 841	2, 841	229, 927	80. 93								
Total, Rathdrum Prairie project	4, 196	3, 460	3, 460	280, 203	80. 98								
Idaho-Wyoming													
Minidoka:													
American Falls Reservoir District No. 2	98, 434	84, 995	84, 995	5, 783, 136	68. 04								
Burley irrigation district	47, 937	44, 598	44, 598	4, 356, 262	97. 68								
Fremont-Madison irrigation district									112, 000	100, 210	100, 567	$8, 232, 911	$81. 86

Minidoka irrigation district	71, 882	64, 378	64, 378	5, 916, 263	91. 90								
North Side pumping division													
Special and Warren Act contractors													
Total, Minidoka project	218, 253	193, 971	193, 971	16, 055, 661	82. 77				112, 000	100, 210	100, 567	8, 232, 911	81. 86
Montana													
Bitter Root [3]	16, 665	16, 432	16, 517	496, 323	30. 05								
Frenchtown	4, 810	3, 516	3, 871	171, 340	44. 26								
Missoula Valley [4]	977	755	770	17, 195	22. 33								
Oregon													
Arnold [3]	4, 248	2, 686	2, 686	227, 849	84. 83								
Baker									7, 312	7, 305	7, 305	210, 500	28. 82
Burnt River									15, 291	15, 240	15, 240	434, 100	28. 48
Deschutes:													
Central Oregon irrigation district [3]									46, 739	41, 303	42, 032	3, 990, 841	94. 95
Lone Pine irrigation district													
North unit	50, 000	48, 137	48, 137	5, 716, 953	118. 76								
Total, Deschutes project	50, 000	48, 137	48, 137	5, 716, 953	118. 76				46, 739	41, 303	42, 032	3, 990, 841	94. 95
Grants Pass [3]	10, 124	6, 946	6, 946	901, 910	129. 85								
Ochoco [3]	8, 500	8, 292	8, 292	489, 887	59. 08								
Umatilla:													
East division	10, 911	7, 016	7, 208	284, 475	39. 47								
South division:													
Stanfield irrigation district [3]									6, 000	5, 125	5, 375	545, 854	101. 55
Westland irrigation district									8, 270	5, 534	5, 589	386, 365	69. 13
West division	7, 246	6, 242	6, 263	354, 725	56. 64								
Total, Umatilla project	18, 157	13, 258	13, 471	639, 200	47. 45				14, 270	10, 659	10, 964	932, 219	85. 03
Vale	32, 000	31, 484	31, 484	1, 818, 956	57. 77								
Oregon-Idaho													
Owyhee:													
Advancement irrigation district	700	578	578	48, 038	83. 11								
Bench irrigation district	2, 342	2, 240	2, 240	363, 790	162. 41								
Crystal irrigation district	1, 280	1, 194	1, 194	263, 792	220. 93								
Gem irrigation district (Idaho)	33, 454	30, 879	30, 726	2, 278, 687	74. 16	450	$6, 750	$15. 00					
Ontario-Nyssa irrigation district	5, 831	5, 585	5, 585	757, 865	135. 70								
Owyhee irrigation district	49, 553	46, 491	46, 429	3, 411, 576	73. 48	62	3, 021	48. 73					
Payette-Oregon Slope irrigation district	4, 659	4, 362	4, 362	710, 099	162. 79								
Ridgeview irrigation district	6, 159	5, 806	5, 909	434, 384	73. 51								
Slide irrigation district	1, 144	1, 103	1, 103	119, 707	108. 53								
Special and Warren Act contractors													
Total Owyhee project	105, 122	98, 238	98, 126	8, 387, 938	85. 48	512	9, 771	19. 08					

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1953*—Continued

State, project, and subdivision	Full supply projects constructed or rehabilitated by the Bureau								Supplemental supply projects constructed or rehabilitated by the Bureau				
	Irrigable area for service [1]	Irrigated area	Land subject to construction charges			Temporarily suspended land [2]			Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
			Net area in cultivation	Gross crop value		Net area in cultivation	Gross crop value	Value per acre				Total	Per acre
				Total	Per acre								
REGION 1—continued													
Washington													
Columbia Basin:	*Acres*	*Acres*	*Acres*			*Acres*			*Acres*	*Acres*	*Acres*		
East Columbia Basin irrigation district	60,777	27,358	28,113	$4,683,157	$166.58								
Quincy-Columbia Basin irrigation district	58,833	29,762	29,777	3,654,125	122.72								
South Columbia Basin irrigation district	12,373	6,838	7,402	712,349	96.24								
Total, Columbia Basin project	131,983	63,958	65,292	9,049,631	138.60								
Okanogan	5,346	3,619	3,894	1,417,087	363.92								
Yakima:													
Kennewick division	4,637	2,679	2,882	668,942	232.11								
Kittitas division	59,610	54,761	54,480	2.377,654	43.64	513	$5,130	$10.00					
Roza division	72,185	63,381	63,348	10,663,922	168.34	33	4,007	121.42					
Sunnyside division	103,309	79.668	80,176	14,986,323	186.92	395	13,848	35.06					
Tieton division	27,271	24,405	24,599	16,907,318	687.32								
Special and Warren Act contractors													
Total, Yakima project	267,012	224,894	225,485	45,604,159	202.25	941	22,985	24.43					
Total, region 1	1,104,981	920,461	923,736	107.067,596	115.91	1,453	32,756	22.54	195,612	174,717	176,108	$13,800,571	$78.36
REGION 2													
California													
Central Valley [5]													
Orland	19,431	17,261	17,261	1,600,864	92.74								

Oregon-California													
Klamath:													
Main division (Oregon)	[6] 39, 364	34, 731	34, 773	3, 321, 611	95. 52	440	24, 810	56. 39					
Tule Lake division (California)	[7] 44, 430	43, 393	43, 393	6, 221, 900	143. 38								
Special and Warren Act contractors													
Leased and water rental lands													
Total, Klamath project	83, 794	78, 124	78, 166	9, 543, 511	122. 09	440	24. 810	56. 39					
Total, region 2	103, 225	95, 385	95, 427	11, 144, 375	116. 78	440	24, 810	56. 39					
REGION 3													
Arizona													
Gila:													
Wellton-Mohawk division	22, 750	22, 396	22, 396	5, 442, 311	243. 00								
Yuma Mesa division:													
North Gila unit	6, 231	6, 057	6, 057	1, 740, 705	287. 39								
South Gila unit													
Yuma Mesa unit	20, 251	13, 920	13, 923	1, 616, 033	116. 07								
Total, Gila project	49, 232	42, 373	42, 376	8, 799, 049	207. 64								
Salt River	241, 322	212, 915	226, 672	57, 501, 277	253. 68								
Yuma Auxiliary	3, 384	2, 112	2, 112	561, 166	265. 70								
Arizona-California													
Yuma:													
Reservation division:													
Bard unit (California)	6, 896	6, 444	6, 467	1, 114, 488	172. 33								
Indian lands (California)	7, 743	5, 388	5, 388	1, 185, 881	220. 10								
Valley division (Arizona)	51, 936	47, 118	47, 118	16, 251, 412	344. 91								
Total, Yuma project	66. 575	58, 950	58, 973	18, 551, 781	314. 58								
California													
Boulder Canyon:													
Coachella division	70, 200	47, 370	47, 370	14, 363, 118	303. 21								
Imperial division [8]													
Total, Boulder Canyon project	70, 200	47, 370	47, 370	14, 363, 118	303. 21								
Total, region 3	430, 713	363, 720	377, 503	99, 776, 391	264. 31								

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1953*—Continued

State, project, and subdivision	Full supply projects constructed or rehabilitated by the Bureau								Supplemental supply projects constructed or rehabilitated by the Bureau				
	Irrigable area for service [1]	Irrigated area	Land subject to construction charges			Temporarily suspended land [2]			Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
			Net area in cultivation	Gross crop value		Net area in cultivation	Gross crop value	Value per acre				Total	Per acre
				Total	Per acre								
REGION 4													
Colorado													
	Acres	*Acres*	*Acres*			*Acres*			*Acres*	*Acres*	*Acres*		
Fruitgrowers Dam [3]									2,678	2,078	2,078	$178,483	$85.89
Grand Valley:													
Garfield gravity division	23,222	21,460	21,460	$1,800,954	$83.92								
Orchard Mesa division [3]	10,027	8,112	8,112	1,707,013	210.43								
Special and Warren Act contractors													
Total, Grand Valley project	33,249	29,572	29,572	3,507,967	118.62								
Mancos [4]									8,598	7,545	7,588	210,143	27.69
Paonia [3]	11,500	8,900	9,070	568,364	62.66								
Pine River									37,446	34,078	34,632	820,431	23.69
Pine River Indian irrigation									9,810	9,407	9,780	223,424	22.84
Uncompahgre	72,662	57,711	58,679	3,839,956	65.44								
Idaho													
Preston Bench [3]									6,738	4,181	4,181	373,622	89.36
Nevada													
Humboldt									37,446	29,363	29,363	1,940,291	66.08
Newlands:													
North Carson division	7,339	4,416	4,394	220,074	50.09	22	$396	$18.00					
South Carson division	56,023	44,471	44,080	1,817,445	41.23	391	4,692	12.00					
Truckee division	7,149	5,241	5,220	224,173	42.95	21	336	16.00					
Total, Newlands project	70,511	54,128	53,694	2,261,692	42.12	434	5,424	12.50					

Nevada-California													
Truckee storage									29,366	22,986	22,986	1,628,864	70.86
Utah													
Hyrum									6,693	5,676	5,684	341,161	60.02
Moon Lake									75,256	53,701	58,796	1,012,548	17.22
Newton [4]									2,553	1,898	1,918	124,257	64.78
Ogden River									22,859	16,258	16,266	1,690,888	103.95
Provo River: Deer Creek division									46,609	40,108	40,488	3,463,459	85.54
Sanpete:													
Ephraim division									7,630	6,733	7,133	295,537	41.43
Spring City division									6,023	4,990	5,778	270,354	46.79
Total, Sanpete project									13,653	11,723	12,911	565,891	43.83
Scofield [4]									15,609	14,392	15,009	826,877	55.09
Strawberry Valley:													
Highline division	17,637	15,984	16,221	846,149	52.16								
Spanish Fork division	13,787	13,298	13,401	1,006,935	75.14								
Springville-Mapleton division	8,924	8,200	8,226	620,554	75.44								
Total, Strawberry Valley project	40,348	37,482	37,848	2,473,638	65.36								
Weber River									108,989	90,914	90,914	9,229,823	101.52
Total, region 4	228,270	187,793	188,863	12,651,617	66.99	434	5,424	12.50	424,303	344,308	352,594	22,630,162	64.18
REGION 5													
New Mexico													
Carlsbad	25,055	21,935	23,108	3,318,191	143.59								
Fort Sumner [3]	6,500	5,254	5,368	508,597	94.75								
Tucumcari	42,214	33,799	35,783	1,715,542	47.94								
New Mexico-Texas													
Rio Grande:													
Elephant Butte irrigation district (New Mexico)	88,000	93,045	86,026	21,190,476	246.33	7,078	1,299,161	183.55					
El Paso County water improvement district No. 1 (Texas)	67,000	66,664	63,171	16,884,426	267.28	3,493	858,802	245.86					
Hudspeth County conservation and reclamation district No. 1 (Texas)													
Total, Rio Grand project	[9] 155,000	159,709	149,197	38,074,902	255.20	10,571	2,157,963	204.14					
Oklahoma													
W. C. Austin	47,810	41,937	46,831	1,683,913	35.96								

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1953*—Continued

State, project, and subdivision	Full supply projects constructed or rehabilitated by the Bureau								Supplemental supply projects constructed or rehabilitated by the Bureau				
	Irrigable area for service [1]	Irrigated area	Land subject to construction charges			Temporarily suspended land [2]			Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
			Net area in cultivation	Gross crop value		Net area in cultivation	Gross crop value	Value per acre				Total	Per acre
				Total	Per acre								
REGION 5—continued													
Texas													
	Acres	*Acres*	*Acres*			*Acres*			*Acres*	*Acres*	*Acres*		
Balmorhea [4]									10,608	7,721	7,782	$934,843	$120.13
Total, region 5	276,579	262,634	260,287	$45,301,145	$174.04	10,571	$2,157,963	$204.14	10,608	7,721	7,782	934,843	120.13
REGION 6													
Montana													
Buffalo Rapids:													
1st division [4]	13,903	12,765	13,509	590,998	43.75								
2nd division	8,792	8,152	8,628	403,411	46.76								
Total, Buffalo Rapids project	22,695	20,917	22,137	994,409	44.92								
Huntley	32,508	24,728	17,284	1,143,598	66.17	7,510	258,362	34.40					
Intake [4]	881	573	573	18,395	32.10								
Milk River:													
Chinook division	43,484	25,720	26,980	979,027	36.29								
Dodson pumping unit [4]	1,180	1,016	1,043	33,170	31.80								
Glasgow division	19,407	11,979	10,272	269,749	26.26	2,364	55,770	23.59					
Malta division	53,733	23,788	16,194	512,336	31.64	8,002	101,679	12.71					
Pumplands	8,000	5,419	5,603	207,977	37.12								
Total, Milk River project	125,804	67,922	60,092	2,002,259	33.32	10,366	157,449	15.19					
Missouri River Basin: Yellowstone division, Savage unit	2,216	2,015	2,015	60,782	30.16								

Sun River:													
Fort Shaw division	11,084	6,884	8,474	170,449	20.11	87	1,224	14.07					
Greenfields division	83,301	66,292	76,330	1,940,850	25.43								
Totals, Sun River project	94,385	73,176	84,804	2,111,299	24.90	87	1,224	14.07					
Montana-North Dakota													
Lower Yellowstone:													
District No. 1 (Montana)	37,272	31,980	31,754	1,770,300	55.75	226	8,763	38.77					
District No. 2 (North Dakota)	19,928	16,596	16,407	854,972	52.11	189	7,346	38.87					
Leased and water rental lands													
Totals, lower Yellowstone project	57,200	48,576	48,161	2,625,272	54.51	415	16,109	38.82					
North Dakota													
Buford-Trenton [4]	9,461	9,084	9,331	330,028	35.37								
Missouri River Basin: Heart division, Heart Butte and Dickinson units													
South Dakota													
Belle Fourche	59,083	53,369	54,158	1,372,144	25.34								
Missouri River Basin: Cheyenne division, Angostura unit [4]	5,207	4,959	5,166	106,886	20.69								
Rapid Valley [4]									8,900	7,211	7,211	184,779	25.62
Wyoming													
Riverton:													
Midvale irrigation district	47,222	43,842	36,397	1,517,251	41.69	7,445	225,260	30.26					
Third division	12,297	11,055	11,055	496,773	44.94								
Total, Riverton project	59,519	54,897	47,452	2,014,024	42.44	7,445	225,260	30.26					
Wyoming-Montana													
Shoshone:													
Frannie division	20,083	10,483	9,639	329,058	34.14	844	13,462	15.95					
Garland division	41,627	33,854	33,310	1,765,395	53.00	544	14,016	25.76					
Heart Mountain division	26,214	23,204	23,204	1,132,864	48.82								
Willwood division	11,426	10,019	10,333	595,816	57.66								
Total, Shoshone project	99,350	77,560	76,486	3,823,133	49.98	1,388	27,478	19.80					
Total, region 6	568,309	437,776	427,659	16,602,229	38.82	27,211	685,882	25.21	8,900	7,211	7,211	184,779	25.62

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1953*—Continued

State, project, and subdivision	Full supply projects constructed or hehabilitated by the Bureau								Supplemental supply projects constructed or rehabilitated by the Bureau				
	Irrigable area for service [1]	Irrigated area	Land subject to construction charges			Temporarily suspended land [2]			Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
			Net area in cultivation	Gross crop value		Net area in cultivation	Gross crop value	Value per acre				Total	Per acre
				Total	Per acre								
REGION 7													
Colorado													
	Acres	*Acres*	*Acres*			*Acres*			*Acres*	*Acres*	*Acres*		
Colorado-Big Thompson									615,000	615,000	615,000	$59,237,730	$96.32
Nebraska													
Mirage Flats [4]	11,657	11,204	11,312	$1,164,207	$102.92								
Missouri River Basin:													
Bostwick division: Superior-Courtland unit	7,940	4,376	4,376	307,642	70.30								
Frenchmen-Cambridge division [3]	16,200	10,390	10,390	620,017	69.57								
Nebraska-Wyoming													
North Platte:													
Gering-Fort Laramie irrigation district	54,845	52,980	52,980	5,227,430	98.67								
Goshen irrigation district (Wyoming)	52,484	50,870	50,870	4,736,000	93.10								
Northport irrigation district	16,170	12,466	12,174	888,220	72.96	1,202	$16,092	$13.39					
Pathfinder irrigation district	[10] 102,824	89,974	89,974	6,388,636	71.01								
Special and Warren Act contractors													
Leased and water rental lands													
Total, North Platte project	226,323	206,290	205,998	17,240,286	83.69	1,202	16,092	13.39					
Wyoming													
Kendrick	16,475	11,966	11,966	403,551	33.72								
Total, region 7	278,595	244,226	244,042	19,735,703	80.87	1,202	16,092	13.39	615,000	615,000	615,000	59,237,730	96.32
Total, all regions	2,990,672	2,511,995	2,517,517	312,279,056	124.04	41.311	2,922,927	70.75	1,254,423	1,148,957	1,158,695	96,788,085	83.53

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1953*—Continued

State, project, and subdivision	Special and Warren Act contractors receiving water from Bureau-constructed works					Leased and water rental lands receiving water from Bureau-constructed works					Entire area receiving full or supplemental water from Bureau-constructed works				
	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
				Total	Per acre				Total	Per acre				Total	Per acre
REGION 1															
Idaho	*Acres*	*Acres*	*Acres*			*Acres*	*Acres*	*Acres*			*Acres*	*Acres*	*Acres*		
Lewiston Orchards [3]											3, 524	2, 231	2, 234	$576, 399	$258. 01
Idaho-Oregon															
Boise:															
Big Bend irrigation district (Oregon)											1, 724	1, 463	1, 463	74, 991	51. 26
Black Canyon irrigation district, unit 1											6, 880	6, 437	6, 610	725, 183	109. 71
Black Canyon irrigation district, unit 2											51, 702	45, 617	45, 917	2, 509, 153	54. 65
Boise-Kuna irrigation district											48, 660	45, 256	45, 256	3, 163, 004	69. 89
Nampa and Meridian irrigation district											40, 196	34, 819	34, 860	2, 300, 746	66. 00
New York irrigation district											17, 826	14, 343	14, 343	557, 530	38. 87
Settlers irrigation district											518				
Wilder irrigation district											56, 558	50, 649	50, 651	5, 886, 298	116. 21
Special and Warren Act contractors	132, 197	122, 900	123, 400	$10, 085, 709	$81. 73						132, 197	122, 900	123, 400	10, 085, 709	81. 73
Total, Boise project	132, 197	122, 900	123, 400	10, 085, 709	81. 73						356, 261	321, 484	322, 500	25, 302, 614	78. 46
Idaho-Washington															
Rathdrum Prairie:															
Hayden Lake unit [3]											1, 087	619	619	50, 276	81. 22
Post Falls unit [3] [4]											3, 109	2, 841	2, 841	229, 927	80. 93
Total, Rathdrum Prairie Project											4, 196	3, 460	3, 460	280, 203	80. 98
Idaho-Wyoming															
Minidoka:															
American Falls Reservoir District No. 2											98, 434	84, 995	84, 995	5, 783, 136	68. 04
Burley irrigation district											47, 937	44, 598	44, 598	4, 356, 262	97. 68
Fremont-Madison irrigation district											112, 000	100, 210	100, 567	8, 232, 911	81. 86
Minidoka irrigation district											71, 882	64, 378	64, 378	5, 916, 263	91. 90
North Side pumping division						6, 033	6, 033	6, 033	$899, 400	$149. 08	6, 033	6, 033	6, 033	899, 400	149. 08
Special and Warren Act contractors	747, 530	712, 034	712, 034	55, 906, 300	78. 52						747, 530	712, 034	712, 034	55, 906, 300	78. 52
Total, Minidoka project	747, 530	712, 034	712, 034	55, 906, 300	78. 52	6, 033	6, 033	6, 033	899, 400	149. 08	1, 083, 816	1, 012, 248	1, 012, 605	81, 094, 272	80. 08

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1953*—Continued

State, project, and subdivision	Special and Warren Act contractors receiving water from Bureau-constructed works					Leased and water rental lands receiving water from Bureau-constructed works					Entire area receiving full or supplemental water from Bureau-constructed works				
	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value: Total	Gross crop value: Per acre	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value: Total	Gross crop value: Per acre	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value: Total	Gross crop value: Per acre
REGION 1—continued															
Montana	*Acres*	*Acres*	*Acres*			*Acres*	*Acres*	*Acres*			*Acres*	*Acres*	*Acres*		
Bitter Root [3]											16, 665	16, 432	16, 517	$496, 323	$30. 05
Frenchtown											4, 810	3, 516	3, 871	171, 340	44. 26
Missoula Valley [4]											977	755	770	17, 195	22. 33
Oregon															
Arnold [3]											4, 248	2, 686	2, 686	227, 849	84. 83
Baker											7, 312	7, 305	7, 305	210, 500	28. 82
Burnt River											15, 291	15, 240	15, 240	434, 100	28. 48
Deschutes:															
Central Oregon irrigation district [3]											46, 739	41, 303	42, 032	3, 990, 841	94. 95
Lone Pine irrigation district	2, 520	2, 460									2, 520	2, 460			
North unit						0	612	612	$55, 007	$89. 88	50, 000	48, 749	48, 749	5, 771, 960	118. 40
Total, Deschutes project	2, 520	2, 460				0	612	612	55, 007	89. 88	99, 259	92, 512	90, 781	9, 762, 801	107. 54
Grants Pass [3]											10, 124	6, 946	6, 946	901, 910	129. 85
Ochoco [3]											8, 500	8, 292	8, 292	489, 887	59. 08
Umatilla:															
East division											10, 911	7, 016	7, 208	284, 475	39. 47
South division:															
Stanfield irrigation district [3]											6, 000	5, 125	5, 375	545, 854	101. 55
Westland irrigation district											8, 270	5, 534	5, 589	386, 365	69. 13
West division						530	463	478	61, 087	127. 80	7, 776	6, 705	6, 741	415, 812	61. 68
Total, Umatilla project						530	463	478	61, 087	127. 80	32, 957	24, 380	24, 913	1, 632, 506	65. 53
Vale											32, 000	31, 484	31, 484	1, 818, 956	57. 77
Oregon-Idaho															
Owyhee:															
Advancement irrigation district											700	578	578	48, 038	83. 11
Bench irrigation district											2, 342	2, 240	2, 240	363, 790	162. 41
Crystal irrigation district											1, 280	1, 194	1, 194	263, 792	220. 93
Gem irrigation district (Idaho)											33, 454	30, 879	31, 176	2, 285, 437	73. 31
Ontario-Nyssa irrigation district											5, 831	5, 585	5, 585	757, 865	135. 70

Owyhee irrigation district											49, 553	46, 491	46, 491	3, 414, 597	73. 45
Payette-Oregon Slope irrigation district											4, 659	4, 362	4, 362	710, 099	162. 79
Ridgeview irrigation district											6, 159	5, 806	5, 909	434, 384	73. 51
Slide irrigation district											1, 144	1, 103	1, 103	119, 707	108. 53
Special and Warren Act contractors	13, 800	12, 860	12, 860	$1, 718, 513	$133. 63						13, 800	12, 860	12, 860	1, 718, 513	133. 63
Total, Owyhee project	13, 800	12, 860	12, 860	1, 718, 513	133. 63						118, 922	111, 098	111, 498	10, 116, 222	90. 73
Washington															
Columbia Basin:															
East Columbia Basin irrigation district											60, 777	27, 358	28, 113	4, 683, 157	166. 58
Quincy-Columbia Basin irrigation district											58, 833	29, 762	29, 777	3, 654, 125	122. 72
South Columbia Basin irrigation district											12, 373	6, 838	7, 402	712, 349	96. 24
Total, Columbia Basin project											131, 983	63, 958	65, 292	9, 049, 631	138. 60
Okanogan											5, 346	3, 619	3. 894	1, 417, 087	363. 92
Yakima:															
Kennewick division											4, 637	2, 679	2, 882	668, 942	232. 11
Kittitas division											59. 610	54, 761	54, 993	2, 382, 784	43. 33
Roza division											72, 185	63, 381	63, 381	10, 667, 929	168. 31
Sunnyside division						270	185	191	33, 533	175. 57	103, 579	79, 853	80, 762	15, 033, 704	186. 15
Tieton division											27, 271	24, 405	24, 599	16, 907, 318	687. 32
Special and Warren Act contractors	181, 761	160, 693	160, 693	31, 826, 852	198. 06						181, 761	160, 693	160, 693	31, 826, 852	198. 06
Total, Yakima project	181, 761	160, 693	160, 693	31, 826, 852	198. 06	270	185	191	33, 533	175. 57	449, 043	385, 772	387, 310	77, 487, 529	200. 07
Total, region 1	1, 077, 808	1, 010, 947	1, 008, 987	99, 537, 374	98. 65	6, 833	7, 293	7, 314	1, 049, 027	143. 43	2, 385, 234	2, 113, 418	2, 117, 598	221, 487, 324	104. 59
REGION 2															
California															
Central Valley [5]	838, 907	611, 054	634, 103	136, 299, 346	214. 95						838, 907	611, 054	634, 103	136, 299, 346	214. 95
Orland											19, 431	17, 261	17, 261	1, 600, 864	92. 72
Oregon-California															
Klamath:															
Main division (Oregon)											39, 364	34, 731	35, 213	3, 346, 421	95. 03
Tule Lake division (California)											44, 430	43, 393	43, 393	6, 221, 900	143. 38
Special and Warren Act contractors	92, 386	85, 989	86, 123	7, 107, 727	82. 53						92, 386	85, 989	86, 123	7, 107, 727	82. 53
Leased and water rental lands						71, 923	32, 372	32, 372	2, 686, 564	82. 99	71, 923	32, 372	32, 372	2, 686, 564	82. 99
Total, Klamath project	92, 386	85, 989	86, 123	7, 107, 727	82. 53	71, 923	32, 372	32, 372	2, 686, 564	82. 99	248, 103	196, 485	197, 101	19, 362, 612	98. 24
Total, region 2	931, 293	697, 043	720, 226	143, 407, 073	199. 11	71, 923	32, 372	32, 372	2, 686, 564	82. 99	1, 106, 441	824, 800	848, 465	157, 262, 822	185. 35

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1953*—Continued

State, project, and subdivision	Special and Warren Act contractors receiving water from Bureau-constructed works					Leased and water rental lands receiving water from Bureau-constructed works					Entire area receiving full or supplemental water from Bureau-constructed works				
	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
				Total	Per acre				Total	Per acre				Total	Per acre
REGION 3															
Arizona															
Gila:	*Acres*	*Acres*	*Acres*			*Acres*	*Acres*	*Acres*			*Acres*	*Acres*	*Acres*		
Wellton-Mohawk division											22,750	22,396	22,396	$5,442,311	$243.00
Yuma Mesa division:															
North Gila unit	984	830	830	$112,729	$135.82						7,215	6,887	6,887	1,853,434	269.12
South Gila unit	785	785	785	133,167	169.64						785	785	785	133,167	169.64
Yuma Mesa unit											20,251	13,920	13,923	1,616,033	116.07
Total, Gila project	1,769	1,615	1,615	245,896	152.26						51,001	43,988	43,991	9,044,945	206.51
Salt River	95,755	79,375	79,375	22,374,339	281.88						337,077	292,290	306,047	79,875,616	260.99
Yuma Auxiliary											3,384	2,112	2,112	561,166	265.70
Arizona-California															
Yuma:															
Reservation division:															
Bard unit (California)											6,896	6,444	6,467	1,114,488	172.33
Indian lands (California)											7,743	5,388	5,388	1,185,881	220.10
Valley division (Arizona)											51,936	47,118	47,118	16,251,412	344.91
Total, Yuma project											66,575	58,950	58,973	18,551,781	314.58
California															
Boulder Canyon:															
Coachella division											70,200	47,370	47,370	14,363,118	303.21
Imperial division [8]	530,000	430,000	445,000	85,543,780	192.23						530,000	430,000	445,000	85,543,780	192.23
Total, Boulder Canyon project	530,000	430,000	445,000	85,543,780	192.23						600,200	477,370	492,370	99,906,898	202.91
Total, region 3	627,524	510,990	525,990	108,164,015	205.64						1,058,237	874,710	903,493	207,940,406	230.15
REGION 4															
Colorado															
Fruitgrowers Dam [3]											2,678	2,078	2,078	178,483	85.89

Grand Valley:															
Garfield Gravity division						1,421	65	72	$8,266	$114.81	24,643	21,525	21,532	1,809,220	84.02
Orchard Mesa division [3]											10,027	8,112	8,112	1,707,013	210.43
Special and Warren Act contractors	9,045	7,675	7,675	2,049,825	267.08						9,045	7,675	7,675	2,049,825	267.08
Total, Grand Valley project	9,045	7,675	7,675	2,049,825	267.08	1,421	65	72	8,266	114.81	43,715	37,312	37,319	5,566,058	149.15
Mancos [4]											8,598	7,545	7,588	210,143	27.69
Paonia [3]											11,500	8,900	9,070	568,364	62.66
Pine River						28	28	28	180	6.43	37,474	34,106	34,660	820,611	23.68
Pine River Indian irrigation											9,810	9,407	9,780	223,424	22.84
Uncompahgre	16,176	15,818	15,954	550,024	34.48						88,838	73,529	74,633	4,389,980	58.82
Idaho															
Preston Bench [3]											6,738	4,181	4,181	373,622	89.36
Nevada															
Humboldt											37,446	29,363	29,363	1,940,291	66.08
Newlands:															
North Carson division											7,339	4,416	4,416	220,470	49.93
South Carson division											56,023	44,471	44,471	1,822,137	40.97
Truckee division											7,149	5,241	5,241	224,509	42.84
Total, Newlands project											70,511	54,128	54,128	2,267,116	41.88
Nevada-California															
Truckee Storage											29,366	22,986	22,986	1,628,864	70.86
Utah															
Hyrum											6,693	5,676	5,684	341,161	60.02
Moon Lake											75,256	53,701	58,796	1,012,548	17.22
Newton [4]											2,553	1,898	1,918	124,257	64.78
Ogden River											22,859	16,258	16,266	1,690,888	103.95
Provo River: Deer Creek division											46,609	40,108	40,488	3,463,459	85.54
Sanpete:															
Ephraim division											7,630	6,733	7,133	295,537	41.43
Spring City division											6,023	4,990	5,778	270,354	46.79
Totals, Sanpete project											13,653	11,723	12,911	565,891	43.83
Scofield [4]											15,609	14,392	15,009	826,877	55.09
Strawberry Valley:															
Highline division											17,637	15,984	16,221	846,149	52.16
Spanish Fork division	3,726	3,585	3,627	279,787	77.14						17,513	16,883	17,028	1,286,722	75.57
Springville-Mapleton division											8,924	8,200	8,226	620,554	75.44
Total, Strawberry Valley project	3,726	3,585	3,627	279,787	77.14						44,074	41,067	41,475	2,753,425	66.39
Weber River											108,989	90,914	90,914	9,229,823	101.52
Total, region 4	28,947	27,078	27,256	2,879,636	105.65	1,449	93	100	8,446	84.46	682,969	559,272	569,247	38,175,285	67.06

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1953*—Continued

State, project, and subdivision	Special and Warren Act contractors receiving water from Bureau-constructed works					Leased and water rental lands receiving water from Bureau-constructed works					Entire area receiving full or supplemental water from Bureau-constructed works				
	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
				Total	Per acre				Total	Per acre				Total	Per acre
REGION 5															
New Mexico	*Acres*	*Acres*	*Acres*			*Acres*	*Acres*	*Acres*			*Acres*	*Acres*	*Acres*		
Carlsbad											25, 055	21, 935	23, 108	$3, 318, 191	$143. 59
Fort Sumner [3]											6, 500	5, 254	5, 368	508, 597	94. 75
Tucumcari											42, 214	33, 799	35, 783	1, 715, 542	47. 94
New Mexico-Texas															
Rio Grande:															
Elephant Butte irrigation district (New Mexico)											88, 000	93, 045	93, 104	22, 489, 637	241. 55
El Paso County water improvement District No. 1 (Texas)						130	130	130	$34, 761	$267. 39	67, 130	66, 794	66, 794	17, 777, 989	266. 16
Hudspeth County conservation and reclamation district No. 1 (Texas)	18, 330	16, 675	18, 330	$2, 686, 651	$146. 57						18, 330	16, 675	18, 330	2, 686, 651	146. 57
Total, Rio Grande project	18, 330	16, 675	18, 330	2, 686, 651	146. 57	130	130	130	34, 761	267. 39	[9] 173, 460	176, 514	178, 228	42, 954, 277	241. 01
Oklahoma															
W. C. Austin											47, 810	41, 937	46, 831	1, 683, 913	35. 96
Texas															
Balmorhea [4]											10, 608	7, 721	7, 782	934, 843	120. 13
Total, region 5	18, 330	16, 675	18, 330	2, 686, 651	146. 57	130	130	130	34, 761	267. 39	305, 647	287, 160	297, 100	51, 115, 363	172. 05
REGION 6															
Montana															
Buffalo Rapids:															
First division [4]						1, 171	1, 171	1, 171	30, 782	26. 29	15, 074	13, 936	14, 680	621, 780	42. 36
Second division [4]						850	850	850	23, 444	27. 58	9, 642	9, 002	9, 478	426, 855	45 04
Total, Buffalo Rapids project						2, 021	2, 021	2, 021	54, 226	26. 83	24, 716	22, 938	24, 158	1, 048, 635	43. 41
Huntley						1, 839	679	693	51, 670	74. 56	34, 347	25, 407	25, 487	1, 453, 630	57. 03
Intake [4]											881	573	573	18, 395	32. 10

Milk River:															
Chinook division	---	---	---	---	---	---	---	---	---	---	43, 484	25, 720	26, 980	979, 027	36. 29
Dodson pumping unit [4]	---	---	---	---	---	---	---	---	---	---	1, 180	1, 016	1, 043	33, 170	31. 80
Glasgow division	---	---	---	---	---	---	---	---	---	---	19, 407	11, 979	12, 636	325, 519	25. 76
Malta division	---	---	---	---	---	---	---	---	---	---	53, 733	23, 788	24, 196	614, 015	25. 38
Pump lands	---	---	---	---	---	---	---	---	---	---	8, 000	5, 419	5, 603	207, 977	37. 12
Total, Milk River project	---	---	---	---	---	---	---	---	---	---	125, 804	67, 922	70, 458	2, 159, 708	30. 65
Missouri River Basin: Yellowstone division, Savage unit	---	---	---	---	---	---	---	---	---	---	2, 216	2, 015	2, 015	60, 782	30. 16
Sun River:															
Fort Shaw division	---	---	---	---	---	35	35	35	780	22. 29	11, 119	6, 919	8, 596	172, 453	20. 06
Greenfields division	---	---	---	---	---	490	358	490	8, 130	16. 59	83, 791	66, 650	76, 820	1, 948, 980	25. 37
Total, Sun River project	---	---	---	---	---	525	393	525	8, 910	16. 97	94, 910	73, 569	85, 416	2, 121, 433	24. 84
Montana-North Dakota															
Lower Yellowstone:															
District No. 1 (Montana)	---	---	---	---	---	---	---	---	---	---	37, 272	31, 980	31, 980	1, 779, 063	55. 63
District No. 2 (North Dakota)	---	---	---	---	---	---	---	---	---	---	19, 928	16, 596	16, 596	862, 318	51. 96
Leased and water rental lands	---	---	---	---	---	535	535	535	20, 448	38. 22	535	535	535	20, 448	38. 22
Total, lower Yellowstone project	---	---	---	---	---	535	535	535	20, 448	38. 22	57, 735	49, 111	49, 111	2, 661, 829	54. 20
North Dakota															
Buford-Trenton [4]	---	---	---	---	---	---	---	---	---	---	9, 461	9, 084	9, 331	330, 028	35. 37
Missouri River Basin: Heart division, Heart Butte and Dickinson units	---	---	---	---	---	357	357	357	19, 562	54. 80	357	357	357	19, 562	54. 80
South Dakota															
Belle Fourche	---	---	---	---	---	48	48	48	1, 959	40. 81	59, 131	53, 417	54, 206	1, 374, 103	25. 35
Missouri River Basin: Cheyenne division, Angostura unit [4]	---	---	---	---	---	---	---	---	---	---	5, 207	4, 959	5, 166	106, 886	20. 69
Rapid Valley [4]	---	---	---	---	---	---	---	---	---	---	8, 900	7, 211	7, 211	184, 779	25. 62
Wyoming															
Riverton:															
Midvale Irrigation district	---	---	---	---	---	761	761	761	24, 272	31. 89	47, 983	44, 603	44, 603	1, 766, 783	39. 61
Third division	---	---	---	---	---	1, 029	1, 029	1, 029	38, 779	37. 69	13, 326	12, 084	12, 084	535, 552	44. 32
Total, Riverton project	---	---	---	---	---	1, 790	1, 790	1, 790	63, 051	35. 22	61, 309	56, 687	56, 687	2, 302, 335	40. 61
Wyoming-Montana															
Shoshone:															
Frannie division	---	---	---	---	---	---	---	---	---	---	20, 083	10, 483	10, 483	342, 520	32. 67
Garland division	---	---	---	---	---	---	---	---	---	---	41, 627	33, 854	33, 854	1, 779, 411	52. 56
Heart Mountain division	---	---	---	---	---	---	---	---	---	---	26, 214	23, 204	23, 204	1, 132, 864	48. 82
Willwood division	---	---	---	---	---	---	---	---	---	---	11, 426	10, 019	10, 333	595, 816	57. 66
Total, Shoshone project	---	---	---	---	---	---	---	---	---	---	99, 350	77, 560	77, 874	3, 850, 611	49. 45
Total, region 6	---	---	---	---	---	7, 115	5, 823	5, 969	219, 826	36. 83	584, 324	450, 810	468, 050	17, 692, 716	37. 80

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1953*—Continued

State, project, and subdivision	Special and Warren Act contractors receiving water from Bureau-constructed works					Leased and water rental lands receiving water from Bureau-constructed works					Entire area receiving full or supplemental water from Bureau-constructed works				
	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value		Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	
				Total	Per acre				Total	Per acre				Total	Per acre
REGION 7															
Colorado	*Acres*	*Acres*	*Acres*			*Acres*	*Acres*	*Acres*			*Acres*	*Acres*	*Acres*		
Colorado-Big Thompson											615, 000	615, 000	615, 000	$59, 237, 730	$96. 32
Nebraska															
Mirage Flats [4]											11, 657	11, 204	11, 312	1, 164, 207	102. 92
Missouri River Basin:															
Bostwick division, Superior-Courtland unit											7, 940	4, 376	4, 376	307, 642	70. 30
Frenchman-Cambridge division [3]											16, 200	10, 390	10, 390	620, 017	59. 67
Nebraska-Wyoming															
North Platte:															
Gering-Fort Laramie irrigation district											54, 845	52, 980	52, 980	5, 227, 430	98. 67
Goshen irrigation district (Wyoming)											52, 484	50, 870	50, 870	4, 736, 000	93. 10
Northport irrigation district											16, 170	12, 466	13, 376	904, 312	67. 61
Pathfinder irrigation district											[10] 102, 824	89, 974	89, 974	6, 388, 636	71. 01
Special and Warren Act contractors	[11] 108, 715	106, 664	106, 664	$11, 474, 356	$107. 57						[11] 108, 715	106, 664	106, 664	11, 474, 356	107. 57
Leased and water rental lands						[12] 22, 366	21, 555	21, 555	$1,802,071	$83. 60	[12] 22, 366	21, 555	21, 555	1, 802, 071	83. 60
Total, North Platte project	108, 715	106, 664	106, 664	11, 474, 356	107. 57	22, 366	21, 555	21, 555	1, 802, 071	83. 60	357, 404	334, 509	335, 419	30, 532, 805	91. 03
Wyoming															
Kendrick											16, 475	11, 966	11, 966	403, 551	33. 72
Total, region 7	108, 715	106, 664	106, 664	11, 474, 356	107. 57	22, 366	21, 555	21, 555	1, 802, 071	83. 60	1, 024, 676	987, 445	988, 463	92, 265, 952	93. 34
Total, all regions	2, 792, 617	2, 369, 397	2, 407, 453	368, 149, 105	152. 92	109, 816	67, 266	67, 440	5, 800, 695	86. 01	7, 147, 528	6, 097, 615	6, 192, 416	785, 939, 868	126. 92

SUMMARY

	Irrigable area for service [1]	Irrigated area	Net area in cultivation	Gross crop value	Value per acre
	Acres	*Acres*	*Acres*		
Full supply projects	2, 852, 697	2, 470, 684	2, 517, 517	$312, 279, 056	$124. 04
Supplemental supply projects	1, 254, 423	1, 148, 957	1, 158, 695	96, 788, 085	83. 53
Special and Warren Act contractors	2, 792, 617	2, 369, 397	2, 407, 453	368, 149, 105	152. 92
Additional areas reported:					
Temporarily suspended lands	137, 975	41, 311	41, 311	2, 922, 927	70. 75
Leased and water rental lands	109, 816	67, 266	67, 440	5, 800, 695	86. 01
Grand totals	7, 147, 528	6, 097, 615	6, 192, 416	785, 939, 868	126. 92
Grand total, 1952	6, 994, 478	5, 955, 750	6, 026, 354	935, 679, 755	155. 26
Increase or decrease, 1952–53 total	+153, 050	+141, 865	+166, 062	−149, 739, 887	−28. 34

[1] Area for which Bureau is prepared to supply water.

[2] Generally part of irrigable area for service but not subject to construction charges until reclaimed.

[3] Private project reconstructed or rehabilitated with Government funds.

[4] Water conservation and utilization project.

[5] Special contract.

[6] Of this irrigable area for service, 929 acres are in California and 38,435 acres are in Oregon.

[7] Of this irrigable area for service, 42,341 acres are in California and 2,089 acres are in Oregon.

[8] Special contract. Bureau constructed dam and canal carriage system. Distribution system and power plants on the All-American Canal were built by Imperial irrigation district. Prior to construction of All-American Canal, district lands were irrigated with Colorado River water from a district-constructed system.

[9] Although there are 178,102 acres that can be irrigated within project limits, the area for which there is considered to be a safe and reliable water supply is 155,000 acres, 88,000 in the Elephant Butte district and 67,000 in the El Paso district.

[10] Of this irrigable area for service, 100,949 acres are in Nebraska and 1,875 acres are in Wyoming.

[11] Of this irrigable area for service, 92,398 acres are in Nebraska and 16,317 acres are in Wyoming.

[12] Of this irrigable area for service, 13,634 acres are in Nebraska and 8,732 acres are in Wyoming.

NOTE.—Per acre value based on net area in cultivation.

TABLE 6.—*Cumulative crop values—1906–53*

Year	Federal irrigation projects [1]					Warren Act lands and special contractors					Entire area				
	Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value		Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value		Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value	
				For year	Cumulative total				For year	Cumulative total				For year	Cumulative total
1906	39,300	[2] 22,300	[2] 20,100	[2] $244,900	----------	----------	----------	----------	----------	----------	39,300	[2] 22,300	[2] 20,100	[2] $244,900	----------
1907	266,300	[2] 187,628	[2] 169,000	[2] 4,760,460	$5,005,360	----------	----------	----------	----------	----------	266,300	[2] 187,628	[2] 169,000	[2] 4,760,460	$5,005,360
1908	488,942	[2] 289,549	[2] 260,500	[2] 7,635,888	12,641,248	----------	----------	----------	----------	----------	488,942	[2] 289,549	[2] 260,500	[2] 7,635,888	12,641,248
1909	730,601	410,628	410,628	11,920,663	24,561,911	----------	----------	----------	----------	----------	730,601	410,628	410,628	11,920,663	24,561,911
1910	917,751	473,423	473,423	12,974,639	37,536,550	----------	----------	----------	----------	----------	917,751	473,423	473,423	12,974,639	37,536,550
1911	1,042,609	564,681	564,681	13,121,224	50,657,774	----------	----------	----------	----------	----------	1,042,609	564,681	564,681	13,121,224	50,657,774
1912	1,205,236	618,680	641,397	14,479,368	65,137,142	----------	----------	----------	----------	----------	1,205,236	618,680	641,397	14,479,368	65,137,142
1913	1,255,381	699,183	642,216	15,732,215	80,869,357	----------	----------	----------	----------	----------	1,255,381	699,183	642,216	15,732,215	80,869,357
1914	1,240,875	761,271	703,424	16,475,517	97,344,874	----------	----------	----------	----------	----------	1,240,875	761,271	703,424	16,475,517	97,344,874
1915	1,472,772	856,778	757,613	18,164,452	115,509,326	----------	----------	----------	----------	----------	1,472,772	856,778	757,613	18,164,452	115,509,326
1916	1,405,452	922,821	858,291	32,815,972	148,325,298	----------	----------	----------	----------	----------	1,405,452	922,821	858,291	32,815,972	148,325,298
1917	1,599,525	1,057,513	966,784	56,462,313	204,787,611	----------	----------	----------	----------	----------	1,599,525	1,057,513	966,784	56,462,313	204,787,611
1918	1,732,374	1,141,516	1,051,193	66,821,396	271,609,007	951,987	[2] 501,100	[2] 481,600	[2] $35,000,000	----------	2,684,361	[2] 1,642,616	[2] 1,532,793	[2] 101,821,396	306,609,007
1919	1,636,159	1,187,255	1,113,469	88,974,137	360,583,144	1,011,815	916,313	880,613	64,004,750	$99,004,750	2,647,974	2,103,568	1,994,082	152,978,887	459,587,894
1920	1,661,960	1,223,480	1,153,820	66,171,650	426,754,794	1,183,292	981,940	950,890	47,505,770	146,510,520	2,845,252	2,205,420	2,104,710	113,677,420	573,265,314
1921	1,674,100	1,227,500	1,157,900	49,620,300	476,375,094	1,146,810	1,001,250	969,550	44,906,130	191,416,650	2,820,910	2,228,750	2,127,450	94,526,430	667,791,744
1922	1,692,700	1,202,130	1,169,100	50,360,850	526,735,944	1,101,700	983,290	951,270	33,240,840	224,657,490	2,794,400	2,185,420	2,120,370	83,601,690	751,393,434
1923	1,718,400	1,213,700	1,179,870	65,046,300	591,782,244	1,231,400	1,051,380	993,040	37,557,860	262,215,350	2,949,800	2,265,080	2,172,910	102,604,160	853,997,594
1924	1,805,730	1,290,890	1,216,610	66,488,560	658,270,804	1,237,885	930,670	889,460	43,237,470	305,452,820	3,043,615	2,221,560	2,106,070	109,726,030	963,723,624
1925	1,802,970	1,320,300	1,242,750	77,608,880	735,879,684	1,340,000	1,019,170	951,250	53,655,850	359,108,670	3,142,970	2,339,470	2,194,000	131,264,730	1,094,988,354
1926	1,844,550	1,411,020	1,361,470	60,664,900	796,544,584	1,329,020	1,097,190	949,590	49,750,040	408,858,710	3,173,570	2,508,210	2,311,060	110,414,940	1,205,403,294
1927	1,956,910	1,378,990	1,431,560	72,047,200	868,591,784	1,482,950	1,148,115	1,072,486	61,160,010	470,018,720	3,439,860	2,527,105	2,504,046	133,207,210	1,338,610,504
1928	1,882,930	1,442,080	1,489,240	81,077,750	949,669,534	1,490,735	1,235,020	1,192,030	62,495,320	532,514,040	3,373,665	2,677,100	2,681,270	143,573,070	1,482,183,574
1929	1,922,330	1,483,900	1,512,250	88,459,390	1,038,128,924	1,480,040	1,234,230	1,192,990	72,720,490	605,234,530	3,402,370	2,718,130	2,705,240	161,179,880	1,643,363,454
1930	1,993,390	1,504,810	1,550,967	65,007,270	1,103,136,194	1,640,722	1,286,046	1,254,493	54,654,550	659,889,080	3,634,112	2,790,856	2,805,460	119,661,820	1,763,025,274
1931	2,027,264	1,552,718	1,520,354	40,554,037	1,143,690,231	1,588,972	1,293,889	1,251,830	33,406,340	693,295,420	3,616,236	2,846,607	2,772,184	73,960,377	1,836,985,651
1932	2,039,074	1,555,144	1,578,880	31,531,162	1,175,221,393	1,512,405	1,214,461	1,196,400	18,627,219	711,922,639	3,551,479	2,769,605	2,775,280	50,158,381	1,887,144,032
1933	2,025,508	1,589,770	1,598,702	48,765,863	1,223,987,256	1,514,201	1,239,017	1,199,113	35,425,870	747,348,509	3,539,709	2,828,787	2,797,815	84,191,733	1,971,335,765
1934	1,986,268	1,552,124	1,527,104	60,928,969	1,284,916,225	1,508,377	1,285,081	1,229,594	40,014,745	787,363,254	3,494,645	2,837,205	2,756,698	100,943,714	2,072,279,479
1935	2,113,506	1,640,936	1,604,166	63,601,663	1,348,517,888	1,500,589	1,294,680	1,256,970	43,179,631	830,542,885	3,614,095	2,935,616	2,861,136	106,781,294	2,179,060,773
1936	2,166,409	1,702,192	1,629,174	78,902,818	1,427,420,706	1,527,008	1,335,995	1,272,745	57,599,662	888,142,547	3,693,417	3,038,187	2,901,919	136,502,480	2,315,563,253
1937	2,194,830	1,725,463	1,700,969	72,893,649	1,500,314,355	1,571,382	1,389,338	1,333,800	45,764,623	933,907,170	3,766,212	3,114,801	3,034,769	118,658,272	2,434,221,525
1938	2,275,882	1,777,584	1,764,363	67,859,804	1,568,174,159	1,507,051	1,329,115	1,276,332	45,603,656	979,510,826	3,782,933	3,106,699	3,040,695	113,463,460	2,547,684,985
1939	2,492,740	1,922,868	1,903,269	73,769,654	1,641,943,813	1,396,800	1,218,108	1,174,803	40,313,140	1,019,823,966	3,889,540	3,140,976	3,078,072	114,082,794	2,661,767,779
1940	2,780,811	2,152,808	2,138,927	80,098,196	1,722,042,009	1,399,057	1,238,262	1,177,103	37,690,481	1,057,514,447	4,179,868	3,391,070	3,316,030	117,788,677	2,779,556,456
1941	3,547,816	2,199,179	2,178,288	110,399,807	1,832,441,816	1,398,338	1,249,204	1,202,172	49,486,191	1,107,000,638	4,946,154	3,448,383	3,380,460	159,885,998	2,939,442,454
1942	3,487,944	2,688,723	2,615,048	193,783,707	2,026,225,523	1,360,757	1,247,512	1,206,651	78,264,809	1,185,265,447	4,848,701	3,936,235	3,821,699	272,048,516	3,211,490,970
1943	2,957,806	2,422,288	2,398,922	218,064,208	2,244,289,731	1,896,026	1,633,041	1,615,424	170,606,761	1,355,872,208	4,853,832	4,055,329	4,014,346	388,670,969	3,600,161,939
1944	2,970,714	2,468,842	2,475,280	224,683,280	2,468,973,011	1,969,281	1,694,861	1,664,069	186,543,084	1,542,415,292	4,939,995	4,163,703	4,139,349	411,226,364	4,011,388,303
1945	2,975,590	2,416,961	2,464,672	232,545,321	2,701,518,332	2,054,746	1,745,627	1,731,060	202,639,074	1,745,054,366	5,030,336	4,162,588	4,195,732	435,184,395	4,446,572,698

1946	3, 079, 761	2, 513, 687	2, 567, 050	279, 711, 300	2, 981, 229, 632	2, 071, 070	1, 808, 282	1, 829, 531	250, 912, 645	1, 995, 967, 011	5, 150, 831	4, 321, 969	4, 396, 581	530, 623, 945	4, 977, 196, 643
1947	3, 091, 977	2, 629, 727	2, 683, 253	300, 474, 560	3, 281, 704, 192	2, 074, 806	1, 831, 975	1, 871, 099	254, 946, 244	2, 250, 913, 255	5, 166, 783	4, 461, 702	4, 554, 352	555, 420, 804	5, 532, 617, 447
1948	3, 221, 464	2, 664, 619	2, 760, 493	277, 160, 874	3, 558, 865, 066	2, 158, 551	1, 894, 136	1, 939, 241	257, 462, 667	2, 508, 375, 922	5, 380, 015	4, 558, 755	4, 699, 734	534, 623, 541	6, 067, 240, 988
1949	3, 296, 297	2, 792, 108	2, 848, 896	277, 347, 763	3, 836, 212, 829	2, 382, 215	2, 028, 481	2, 067, 338	238, 981, 245	2, 747, 357, 167	5, 678, 512	4, 820, 589	4, 916, 234	516, 329, 008	6, 583, 569, 996
1950	3, 398, 168	2, 857, 533	2, 918, 105	287, 683, 368	4, 123, 896, 197	2, 626, 342	2, 219, 653	2, 271, 358	290, 554, 341	3, 037, 911, 508	6, 024, 510	5, 077, 186	5, 189, 463	578, 237, 709	7, 161, 807, 705
1951	4, 049, 409	3, 596, 094	3, 624, 299	445, 407, 191	4, 569, 303, 388	2, 663, 606	2, 279, 675	2, 317, 714	376, 314, 474	3, 414, 225, 982	6, 713, 015	5, 875, 769	5, 942, 013	821, 721, 665	7, 983, 529, 370
1952	4, 264, 906	3, 643, 544	3, 681, 216	504, 544, 596	5, 073, 847, 984	2, 729, 572	2, 312, 206	2, 345, 138	431, 135, 159	3, 845, 361, 141	6, 994, 478	5, 955, 750	6, 026, 354	935, 679, 755	8, 919, 209, 125
1953	4, 354, 911	3, 728, 218	3, 784, 963	417, 790, 763	5, 491, 638, 747	2, 792, 617	2, 369, 397	2, 407, 453	368, 149, 105	4, 213, 510, 246	7, 147, 528	6, 097, 615	6, 192, 416	785, 939, 868	9, 705, 148, 993

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[1] Includes projects constructed by the United States and those for which supplemental water is furnished from storage works built by the United States.

[2] Estimated.

Highlights of achievements in several regions include the following:

In the Northwest the area in cultivation increased 53,170 acres with the principal increase taking place on the Columbia Basin project, Washington. Per acre yields were comparable to those obtained in 1952 when the highest total value harvest was achieved. However, a dip in the general level of prices received by farmers for crops contributed to a decline in total crop value.

The relatively high average value per acre of crops in region 2 ($185) and region 3 ($230) reflects the production of high value crops such as vegetables, truck, fruit, and cotton on a relatively large percentage of the area and the multiple cropping of a considerable acreage. The irrigable area for service was increased 55,729 acres in region 2 and 31,256 acres in region 3. Approximately one-half of the 31,000-acre lettuce crop of the Imperial division of the Boulder Canyon project was processed for shipment in recently constructed vacuum cooling plants in the valley, which reduce the temperature of the lettuce to 33° in about 20 minutes.

Many of the projects of region 4 are characterized by high elevations and mountain valleys with a relatively short growing season, and are subject to late spring and early fall frosts. Fruit production declined from the 1952 level on six projects by reason of late spring frosts.

All projects in region 5, except Fort Sumner, N. Mex., reported a shortage of water for the 1953 season.

Projects in region 6 are primarily producers of cereals and forage crops utilized as livestock feed. Approximately 85 percent of the irrigated area is used for these crops. Growing conditions were favorable on all projects except Belle Fourche which experienced frost late in the spring and hail in July.

In region 7, the Frenchman-Cambridge division of the Missouri River Basin project was prepared to serve 11,500 new acres for the first time in 1953. The Colorado Big-Thompson project works delivered approximately 177,594 acre-feet of water to the Northern Colorado Water Conservancy District as compared with 41,141 acre-feet delivered in 1952.

Land Openings

During the fiscal year 1954, 9 land openings conducted by the Bureau on 4 reclamation projects opened for settlement 389 new farm units totaling 34,126 acres.

The greatest number of the foregoing were on the Columbia Basin project where 256 units were offered for sale under the provisions of the Columbia Basin Project Act. These included 15 part-time and 32 full-time farm units in the East Columbia Basin Irrigation District, 6 part-time and 30 full-time farm units in the Quincy-Columbia Basin Irrigation District, and 173 full-time farm units in the South Columbia Basin Irrigation District. Similarly, 28 farm units were offered for sale in the Wellton-Mohawk division of the Gila project under provisions of that project's authorization act. The remaining 105 farm units, opened for settlement under the provisions of reclamation and homestead laws, consisted of 85 farm units in the North Side pumping unit of the Minidoka project and 20 farm units in the Coachella division of the All-American Canal system, Boulder Canyon project.

The number of part-time farm units made available was 60 percent less than the average of the preceding 3 years. Settlement opportunities, however, were considerably enhanced over those of the preceding year by virtue of a 75-percent increase in the availability of full-time farm units. Despite this increase in the number of farm units offered for settlement, the demand by qualified applicants still continued to far exceed the available supply with an overall average of 71 applicants for each farm unit opened for sale or homesteading. Enactment of legislation (Public Law 402, 83d Cong., 2d sess.) extending present veterans' preference in land openings to veterans of the Korean conflict will in all probability result in a still further increase in the ratio between applicants and available farm units.

Since the close of World War II a total of 152,622 acres of land comprising 1,838 farm units on 13 reclamation projects have been opened to settlement. That these settlers have been eminently successful is evidenced by the extremely small response to date to the provisions of the act of August 13, 1953 (67 Stat. 566), providing for the exchange of farm units, on Federal irrigation projects, which prove insufficient to support a family.

Cooperative working relationships established by the Bureau with the Farmers Home Administration, the Agricultural Extension Service, the several State colleges and universities and comparable agencies, have been maintained. Additional agreements were consummated throughout the year whenever possible in the interest of project entrymen and their successful solution of farm unit development and management problems.

During the fiscal year 1955 it is anticipated that additional farm units will be made available to settlers. These land openings will be conducted on the Columbia Basin and Yakima projects, Washington; the Minidoka project, Idaho; and the Gila project, Arizona. A few additional farm units may be available on one or more of the other Bureau projects.

Development Farms

The development farm program begun in 1947 has been continued in cooperation with several Department of Agriculture agencies and State agricultural colleges. From 10 to 20 percent of each farm is set aside for use by the cooperating agencies for conducting research in water use, fertilizers, crop diseases and other special problems peculiar to the area in question.

The remainder of the farm is used to demonstrate research findings as well as the most effective methods of irrigation, water requirements of crops, cropping practices, crops best adapted to the area, farm layout systems and other agricultural practices of which the new settlers may have had little or no experience. The farms are aiding also in determining the feasibility of developing certain areas for irrigation where the soil and water quality are such that sustained irrigation may be questionable.

The information obtained through the development farm program is disseminated jointly by the Bureau and the cooperating agencies by means of field days, tours, and other educational media. The program has aided the new settlers materially in making the early success of their irrigated farms and has helped to safeguard the Government's investment.

To date 22 development farms have been established of which four have served their purpose and have been discontinued. The farms are located in the Columbia Basin project, Washington; Missouri River Basin project, North Dakota, South Dakota, Kansas, and Nebraska; and Gila project, Arizona.

During consideration of the fiscal year 1955 Interior appropriation bill, the Congress directed that a review of the development farm program be made by the Departments of Agriculture and Interior and the Bureau of the Budget. Based on this review recommendations covering future operations are to be submitted to the 84th Congress.

Repayment and Water Service Contracts

During fiscal year 1954, repayment contracts were entered into with 10 irrigation districts to assure the return of the cost of construction of new irrigation works and for municipal water service. In addition delivery of water to over 67 contracting organizations was provided for by interim and long-term water service type contracts executed during the year with irrigation districts and municipalities. Contracts providing for reimbursement of emergency and rehabilitation and betterment funds, or for adjustment of other contract provisions, were executed with 20 organizations. During fiscal year 1954, amendatory basic construction repayment contracts were negotiated with 8 irrigation districts on 7 Federal reclamation projects involving the repayment of some $45 million. Special legislation authorizing these contracts either was enacted during the year or was under consideration by the Congress at the close of the fiscal year. Negotiations of similar amendatory repayment contracts which must be submitted to the Congress are under way or are scheduled with additional irrigation districts involving construction costs approximating $50 million.

Soil and Moisture Conservation Operations

In keeping with the Department's policy of conservation of natural resources the Bureau has continued its soil and moisture conservation operations on lands under its jurisdiction. These activities have included erosion control on public lands, protection of reservoirs, canals and other irrigation works from siltation, and prevention of water losses detrimental to irrigation projects.

The program objectives are accomplished in cooperation with other Federal agencies as well as State and local agencies. Water users' organizations also assist in planning the work and in many cases furnish a part of the labor, materials, and funds. The work performed under this program is resulting in valuable assistance in protecting and improving the lands administered by the Bureau.

Some of the particular work items undertaken during the year included reseeding watershed areas, erosion control and soil stabilization, sand dune control, salt cedar control investigations, and protection of numerous irrigation facilities in the 17 Western States.

Drainage

Drainage investigations were conducted primarily on projects which have been in operation for several seasons. The operation of the projects aid materially in the determination of the drainage facilities required.

The construction of drainage facilities is in numerous instances financed by the water users with technical assistance from the Bureau of Reclamation. However, where the requirement of drainage facilities can be determined during the construction period of a project, the financing of the work is handled by the Bureau of Reclamation as part of the construction cost.

The investigation program has been performed in numerous instances with the cooperation of the Geological Survey and agencies of the Department of Agriculture.

Weed Control

The comprehensive program of weed control has been continued to further reduce the problems and costs caused by weeds on the banks and in the channels of distribution and drainage systems.

More effective and economical methods for controlling weeds have been developed through research conducted in cooperation with the Weed Investigation Section, Department of Agriculture, at four field stations and the Denver laboratory. In Denver special attention has been given to developing methods for controlling salt cedar, submersed waterweeds, and algae because of the special problems they create in connection with irrigation projects. The use of radioactive isotopes in tracing movement and concentration of herbicides in plant tissues also has been continued in Denver.

The application of methods thus developed together with the use of more efficient equipment for applying herbicides have materially reduced water losses and maintenance costs and have increased operation efficiency.

Federal and private irrigation projects are kept abreast of new developments in weed control through the use of motion pictures, slide lectures, Reclamation Era articles, handbooks and other educational media prepared by the Bureau. A second edition of the handbook on equipment used for weed control on irrigation systems was prepared and distributed during the year.

Cooperation With Other Agencies

As in the past, the Bureau has worked closely with agencies in the Department of Agriculture, the State colleges and extension services, and other Federal, State, and local agencies. The cooperative undertakings with these agencies have been initiated and carried out through memoranda of understanding or cooperative agreements. As a result of this work the Bureau and the settlers on irrigation projects have obtained much valuable assistance and information. During the year 141 agreements were in effect, of which 46 were executed during the fiscal year.

Public Use of Reservoirs

Construction of dams and reservoirs for irrigation and power development provides incidental but very definite benefits through the creation of exceptional public use opportunities. This is particularly true in the more arid parts of the West.

Except in the Missouri River Basin, the Bureau of Reclamation is not authorized to expend funds for development of reservoir areas for public uses. At certain reservoirs where possibilities for use by the public are deemed to be of national significance, such as Lake Mead, on the Colorado River between Arizona and Nevada; Franklin D. Roosevelt Lake, on the Columbia River in Washington; Millerton Lake on the San Joaquin River in California; and Shadow Mountain Lake, and Lake Granby on the Colorado River in Colorado; responsibility for the development and administration of such facilities has been delegated to the National Park Service. The National Park Service is, in effect, the agent of the Bureau in public use matters and negotiates for the development and administration, by local or State governmental agencies, of reservoir areas which are of local or State significance. At certain reservoirs located within the national forest boundaries, facilities are administered by the United States Forest Service.

Federal Tax Revenues and Reclamation

Each step taken in the development of the Nation's basic resources moves the economy of the Nation to a new and higher plateau. This is strikingly demonstrated in an analysis of Federal tax revenues from Federal reclamation project areas. Based on the projected results of a sample study of 15 reclamation projects, the estimated cumulative return to the Treasury from the 69 projects or divisions of projects receiving water under the Federal reclamation program in 1953 now stands at well over $3.1 billion. This is an amount greater than total reclamation expenditure for all project works since the beginning of the Federal reclamation program in 1902.

The benefits accruing to the Nation through reclamation development are also measured in terms of families served, crop production and value, livestock raised, and acres irrigated. They are expressed in rapidly expanding trade and business activity, in direct repayment to the Government by the beneficiaries of reclamation, in increased population on and adjacent to projects, and in a wide variety of other phenomena. These are all tangible, measurable benefits of a broad and lasting nature. They translate into expanding business activities in the project and surrounding areas. They filter to every State in the Union and every segment of society. They provide through this process additional economic stability to the Nation which is reflected in part by increased revenues to the Treasury in the faraway States and areas as well as on the projects themselves.

The estimate of Federal tax revenues from reclamation project areas is, therefore, only a partial measure of the true contribution of basic reclamation resource development to the Nation's tax structure and to the economy as a whole.

In 1953 individual income taxes paid directly by irrigation farmers and by persons of the neighboring towns and villages whose business or employment was affected by the construction of 15 selected reclamation projects were estimated at $106 million. The aggregate individual income tax revenues from this sample study area since income tax collections started in 1916 is estimated at over $800 million.

In addition to individual tax revenues, an appropriate share of corporation and excise tax revenues collected in the same 15 project areas is directly attributable to reclamation development. Estimated receipts from these sources total nearly $500 million. The combined returns from individual and corporate tax revenues accordingly are estimated at $1.3 billion. Total Federal project construction cost through June 30, 1953, for the same projects aggregated $269 million. Thus far, Federal taxes collected have exceeded the Federal investment in irrigation features in these projects by about five times.

POWER DIVISION

Installation and production of hydroelectric powerplant capacity increased on the multipurpose projects of the Bureau of Reclamation during fiscal year 1954. On June 30, 1954, the total installed capacity in powerplants constructed and operated by the Bureau of Reclamation was 4,718,450 kilowatts. The increased capacity of 297,250 kilowatts, together with existing facilities, served market areas in the Western United States with electric energy for industrial and domestic purposes.

Present Installed Capacity

During the fiscal year ending June 30, 1954, the Bureau had 29 powerplants with a total nameplate capacity of 4,718,450 kilowatts, an increase of 297,250 kilowatts capacity over the fiscal year 1953 figures. The capacity installed during fiscal year 1954 is as follows:

	Kilowatts
Colorado-Big Thompson project	104, 750
Hungry Horse project	142, 500
Missouri River Basin project	50, 000
Total	297, 250

Powerplants operated by other agencies, principally water users' organizations on reclamation projects, totaled 15, of which 9 were originally constructed by the Bureau. These 9 plants have an installed nameplate capacity of 30,827 kilowatts; the 6 other plants constructed by the water users' organizations have an installed nameplate capacity of 82,500 kilowatts.

Additional Capacity Under Construction

At the end of fiscal year 1954, the Bureau of Reclamation had under construction 6 powerplants, which will have an ultimate installed nameplate capacity of 367,500 kilowatts.

The United States Army Corps of Engineers is proceeding with the construction of its plants on the Missouri River Basin project. The Bureau of Reclamation will be the marketing agent for energy generated by all plants constructed by the Corps on the Missouri River Basin project.

TABLE 7.—*Bureau of Reclamation power systems, power sales, and revenues, by projects, fiscal year ending June 30, 1954* [1]

Projects	Sales of electric energy, kilowatt-hours	Revenues from sales
Boise project	210, 558, 188	$463, 144. 63
Columbia basin project [2]	14, 224, 917, 000	12, 545, 618. 82
Minidoka project	125, 539, 969	525, 166. 64
Yakima project	25, 809, 400	65, 758. 65
Hungry Horse project [3]	685, 023, 780	4, 300, 259. 52
Central Valley project	2, 530, 304, 113	9, 297, 970. 89
Boulder Canyon project	4, 239, 896, 592	9, 531, 689. 87
Parker-Davis project	1, 379, 428, 917	5, 385, 340. 62
Yuma project	6, 130, 614	24, 128. 38
Rio Grande project	134, 035, 528	914, 066. 00
Fort Peck project	541, 293, 924	2, 073, 739. 56
North Platte project	61, 292, 699	416, 991. 71
Missouri River Basin—western division, including power systems of Riverton, Shoshone, Colorado-Big Thompson, and Kendrick projects	809, 706, 031	4, 989, 102. 08
Missouri River Basin, eastern division	97, 426, 659	279, 282. 69
Total	25, 071, 363, 414	50, 812, 260. 06

[1] Does not include energy sales and revenues in transactions between Bureau projects.

[2] Totals include 13,828,539,367 kilowatt-hours delivered to Bonneville Power Administration for marketing and $12,347,430 in payments by that agency, but do not include payments for river regulation benefits.

[3] Totals include 682,133,537 kilowatt-hours delivered to Bonneville Power Administration for marketing and $4,286,210 in payments by that agency.

Authorized To Be Constructed

Authorized to be constructed by the Bureau of Reclamation as of June 30, 1954, are 32 powerplants with an ultimate total nameplate capacity of 1,135,950 kilowatts.

The status of hydroelectric powerplants on reclamation projects is shown in table 8.

TABLE 8.—*Hydroelectric plants on Reclamation projects—operating, under construction, or authorized as of June 30, 1954*

A. CONSTRUCTED AND OPERATED BY BUREAU OF RECLAMATION

State	Project	Name of plant	Calendar year of initial operation	Nameplate capacity		Number and namplate capacity of generators	
				Existing (kilowatts)	Ultimate (kilowatts)	Existing (kilowatts)	Ultimate (kilowatts)
1. Arizona-Nevada	Boulder Canyon	Hoover [1]	1936	1, 249, 800	1, 354, 300	14–82,500; 1–40,000; 2–2,400; 1–50,000.	14–82,500; 1–40,000; 1–50,000; 2–2,400; 1–104,500.
2. Arizona-Nevada	Davis Dam	Davis	1951	225, 000	225, 000	5–45,000	5–45,000.
3. Arizona-Nevada	Parker	Parker	1942	120, 000	120, 000	4–30,000	4–30,000.
4. California	Central Valley	Keswick	1949	75, 000	75, 000	3–25,000	3–25,000.
5. California	Central Valley	Shasta	1944	379, 000	379, 000	5–75,000; 2–2,000	5–75,000; 2–2,000.
6. California	Yuma	Siphon Drop	1926	1, 600	1, 600	2–800	2–800.
7. Colorado	Colorado-Big Thompson	Estes	1950	45, 000	45, 000	3–15, 000	3–15,000
8. Colorado	do	Flatiron	1954	71, 500	71, 500	2–31,500; 1–8,500	2–31,500; 1–8,500.
9. Colorado	do	Green Mountain	1943	21, 600	21, 600	2–10, 800	2–10,800.
10. Colorado	do	Marys Lake	1951	8, 100	8, 100	1–8,100	1–8,100.
11. Colorado	do	Polehill	1954	33, 250	33, 250	1–33,250	1–33,250.
12. Idaho	Boise	Anderson Ranch	1950	27, 000	[2] 40, 500	2–13,500	3–13,500 [2].
13. Idaho	do	Black Canyon	1925	8, 000	8, 000	2–4,000	2–4,000.
14. Idaho	do	Boise Diversion	1912	1, 500	1, 500	3–500	3–500.
15. Idaho	Minidoka	Minidoka	1909	13, 400	13, 400	1–5,000; 1–2,400; 5–1,200	1–5,000; 1–2,400; 5–1,200.
16. Montana	Missouri River Basin	Canyon Ferry	1953	50, 000	50, 000	3–16,667	3–16,667.
17. Montana	Hungry Horse	Hungry Horse	1952	285, 000	285, 000	4–71,250	4–71,250.
18. New Mexico	Rio Grande	Elephant Butte	1940	24, 300	24, 300	3–8,100	3–1,800.
19. South Dakota	Missouri River Basin	Angostura	1951	1, 200	1, 200	1–1,200	1–1,200.
20. Washington	Columbia Basin	Grand Coulee [3] [4]	1941	1, 974, 000	1, 974, 000	18–108,000 [4]; 3–10,000	18–108,000 [4]; 3–10,000.
21. Washington	Yakima	Prosser	1932	2, 400	2, 400	1–2,400	1–2,400.
22. Wyoming	Kendrick	Seminoe	1939	32, 400	32, 400	3–10,800	3–10,800.
23. Wyoming	Missouri River Basin	Boysen	1952	15, 000	15, 000	2–7,500	2–7,500.
24. Wyoming	do	Kortes	1950	36, 000	36, 000	3–12,000	3–12,000.
25. Wyoming	North Platte and Missouri River Basin.	Guernsey [5]	1927	4, 800	14, 800	2–2,400	2–2,400; 1–10,000.
26. Wyoming	North Platte	Lingle	1919	1, 400	1, 400	2–400; 2–300	2–400; 2–300.
27. Wyoming	Riverton	Pilot Butte	1925	1, 600	1, 600	2–800	2–800.
28. Wyoming	Shoshone	Heart Mountain	1948	5, 000	5, 000	1–5,000	1–5,000.
29. Wyoming	do	Shoshone	1922	5, 600	5, 600	1–4,000; 2–800	1–4,000; 2–800.
Subtotal A				4, 718, 450	4, 846, 450		

B. CONSTRUCTED BY BUREAU OF RECLAMATION: OPERATED BY OTHERS

1. Arizona	Salt River	Arizona Falls [6]	1913	850	850	2-425	2-425.
2. Arizona	do	Cross Cut [6]	1914	5, 100	5, 100	1-3,000; 3-700	1-3,000; 3-700.
3. Arizona	do	Roosevelt	1909	15, 400	15, 400	5-1,080; 1-4,000; 1-6,000	5-1,080; 1-4,000; 1-6,000.
4. Arizona	do	South Consolidated [6]	1912	1, 600	1, 600	2-800	2-800.
5. Colorado	Grand Valley	Grand Valley (Palisade)	1932	3, 000	3, 000	2-1,500	2-1,500.
6. Nevada	Newlands	Lahontan	1911	1, 640	1, 640	1-640; 2-500	1-640; 2-500.
7. Oregon	Deschutes	Cove [7]	1946	1, 500	1, 500	1-1,500	1-1,500.
8. Utah	Strawberry Valley	Spanish Fork [8]	1908	1, 550	1, 550	2-450; 1-250; 1-400	2-450; 1-250; 1-400.
9. Washington	Yakima	Rocky Ford (now idle)	1916	187	187	1-187	1-187.
Subtotal B				30, 827	30, 827		

C. CONSTRUCTED AND OPERATED BY WATER USERS ORGANIZATIONS

1. Arizona	Salt River	Chandler [9]	1919	600	600	1-600	1-600.
2. Arizona	do	Horse Mesa [9]	1927	30, 000	30, 000	3-10,000	3-10,000.
3. Arizona	do	Mormon Flat [9]	1926	7, 000	7, 000	1-7,000	1-7,000.
4. Arizona	do	Stewart Mountain [9]	1930	10, 400	10, 400	1-10,400	1-10,400.
5. California	All-American	Drop Nos. 3 and 4 [10]	1941	34, 000	34, 000	1-5,200; 3-9,600	1-5,200; 3-9,600.
6. Oregon	Klamath	C Canal Drop [11]	1938	500	500	1-500	1-500.
Subtotal C				82, 500	82, 500		

D. CONSTRUCTED AND OPERATED BY CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY: POWER MARKETED BY BUREAU OF RECLAMATION

1. Montana	Fort Peck	Fort Peck	1943	85, 000	185, 000	2-35,000; 1-15,000	3-35,000; 2-40,000.
2. South Dakota	Missouri River Basin	Fort Randall	1954	80, 000	320, 000	2-40,000	8-40,000.
Subtotal D				165, 000	505, 000		

E. UNDER CONSTRUCTION BY BUREAU OF RECLAMATION

1. Alaska	Eklutna	Eklutna	1954	0	30, 000	0	2-15, 000.
2. California	Central Valley	Folsom	1955	0	162, 000	0	3-54, 000.
3. California	do	Nimbus	1955	0	13, 500	0	2-6, 750.
4. Idaho	Palisades	Palisades	1957	0	114, 000	0	4-28, 500.
5. Washington	Yakima-Kennewick Division.	Chandler	1955	0	12, 000	0	2-6, 000.
6. Wyoming	Kendrick	Alcova	1954	0	36, 000	0	2-18, 000.
Subtotal E				0	367, 500		

See footnotes at end of table.

TABLE 8.—*Hydroelectric plants on Reclamation projects—operating, under construction, or authorized as of June 30, 1954*—Continued

F. UNDER CONSTRUCTION BY CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY: POWER TO BE MARKETED BY BUREAU OF RECLAMATION

State	Project	Name of plant	Calendar year of initial operation	Nameplate capacity		Number and namplate capacity of generators	
				Existing (kilowatts)	Ultimate (kilowatts)	Existing (kilowatts)	Ultimate (kilowatts)
1. North Dakota	Missouri River Basin	Garrison	1955	0	400,000	0	5–80,000.
2. South Dakota	do	Gavins Point	1956	0	100,000	0	3–33,333.
3. South Dakota	do	Oahe	1961	0	425,000	0	5–85,000.
Subtotal F				0	925,000		

G. AUTHORIZED TO BE CONSTRUCTED BY BUREAU OF RECLAMATION

State	Project	Name of plant	Calendar year of initial operation	Nameplate capacity		Number and namplate capacity of generators	
				Existing (kilowatts)	Ultimate (kilowatts)	Existing (kilowatts)	Ultimate (kilowatts)
1. California	Central Valley	Trinity	1963	0	90,000	0	4–22,500.
2. California	do	Lewiston	1961	0	2,000	0	1–2,000.
3. California	do	Tower House	1961	0	66,000	0	3–22,000.
4. California	do	Matheson	1961	0	75,000	0	3–25,000.
5. Colorado	Collbran	Molina	1959	0	5,500	0	1–5,500.
6. Colorado	do	Cameo	1960	0	2,500	0	1–2,500.
7. Colorado	Colorado-Big Thompson	Big Thompson	1958	0	4,500	0	1–4,500.
8. Idaho	Minidoka	American Falls	1959	0	30,000	0	3–10,000.
9. Montana	Missouri River Basin	Lyon	1963	0	24,000	0	3–8,000.
10. Montana	do	Absaroka	1964	0	50,000	0	3–16,667.
11. Montana	do	Portage	1963	0	20,000	0	2–10,000.
12. Montana	do	Yellowtail	1960	0	200,000	0	4–50,000.
13. Montana	do	Moorhead	1970	0	8,000	0	2–4,000.
14. Montana	do	Reichle	1963	0	20,000	0	2–10,000.
15. Montana	do	Little Porcupine	1970	0	18,000	0	3–6,000.
16. Montana	do	Kenil	1963	0	1,600	0	2–800.
17. Montana	do	Tiber	1958	0	2,000	0	3–667.
18. Nebraska	do	Harlan		0	1,200	0	1–1,200.
19. Nebraska	do	Lincoln Valley	1963	0	50,000	0	3–16,667.
20. North Dakota	do	Lonetree	1965	0	45,000	0	3–15,000.
21. South Dakota	do	Pony Hills	1963	0	180,000	0	4–45,000.
22. Utah	Weber Basin	Gateway	1957	0	4,000	0	2–1,700; 1–600.
23. Utah	do	Wanship	1957	0	1,400	0	1–1,400.
24. Utah	Provo River Basin	Deer Creek	1957	0	5,000	0	2–2,500.
25. Washington	Yakima Roza Division	Roza	1958	0	11,250	0	2–5,625.
26. Wyoming	Missouri River Basin	Bald Ridge	1963	0	30,000	0	3–10,000.

27. Wyoming	do	Hunter Mountain	1964	0	12, 000	0	2-6, 000.
28. Wyoming	do	Sunlight	1964	0	20, 000	0	2-10, 000.
29. Wyoming	do	Thief Creek	1964	0	60, 000	0	3-20, 000.
30. Wyoming	do	Glendo	1961	0	24, 000	0	2-12, 000.
31. Wyoming	do	Tongue River	1964	0	25, 000	0	2-12, 500.
32. Wyoming	do	Fremont Canyon	1961	0	48, 000	0	2-24, 000.
Subtotal G				0	1, 135, 950		

H. AUTHORIZED TO BE CONSTRUCTED BY CORPS OF ENGINEERS, DEPARTMENT OF THE ARMY: POWER TO BE MARKETED BY BUREAU OF RECLAMATION

1. California	Central Valley	Iron Canyon		0	54, 000	0	3-18, 000.
2. South Dakota	Missouri River Basin	Big Bend [12]	1964	0	120, 000	0	6-20, 000.
Subtotal				0	174, 000		
Total				4, 996, 777	8, 067, 227		

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[1] Powerplant units operated by power allottees under agency contract.

[2] 27,000 kilowatts authorized; space provided in plant for third unit.

[3] Power marketed by Bonneville Power Administration.

[4] Main units with a nameplate rating at 108,000 kilowatts have continuous operating capacity of 120,000 kilowatts.

[5] Proposed 10,000 kilowatt addition would be a Missouri River Basin project feature. No schedule for initial operation available.

[6] Powerplant constructed by Bureau of Reclamation with Salt River Valley Water Users' Association funds.

[7] Unit No. 3 installed in Pacific Power & Light Co.'s Cove No. 2 plant.

[8] 3 plants: (a) Spanish Fork (upper); (b) Spanish Fork (lower); (c) Payson.

[9] Salt River Valley Water Users' Association plant.

[10] Imperial irrigation district's plant.

[11] Enterprise irrigation district's plant.

[12] Not definitely scheduled. Installed capacity and installation dates tentative pending completion of project planning studies.

Transmission Lines

On June 30, 1954, the Bureau of Reclamation's transmission system consisted of 8,745 circuit miles of line. During fiscal year 1954, 312 circuit miles of transmission lines were completed. These are shown in table 9:

TABLE 9.—*Transmission lines completed during fiscal year 1954*

Project and line	Voltage (kilovolts)	In service date	Circuit miles
Missouri River Basin project, Fort Randall powerplant to Oahe temporary substation	230	March 1954	137.97
Fort Randall powerplant to Fort Randall tap	115	June 1954	[1] 23.7
Oahe temporary substation to Midland	115	March 1954	57.6
Montana Dakota utility powerplant to Devaul substation	69	September 1954	40.66
Oahe temporary substation to Fort Thompson (Big Bend) [2]	230	(3)	51.77
Total			311.70

[1] 2 circuits for the total of 23.7 miles.
[2] Second circuit part of the Fort Randall powerplant to Oahe temporary substation double circuit line.
[3] Completed but not energized.

Power contracts.—During fiscal year 1954, 54 contracts for delivery of power were executed. Included among these are:

Number of contracts:
- 11 with private utilities.
- 25 with REA cooperatives.
- 3 with municipalities.
- 2 with other Federal agencies.
- 3 with public power districts.
- 4 with State authorities.
- 6 miscellaneous type contracts.

A number of contracts executed were renewals of operating contracts or revisions of existing contracts resulting from changed operating conditions.

The Bureau continued its policy of contracting whenever possible with private utilities and cooperatives for wheeling power and energy over existing facilities. The Bureau also entered into several interchange agreements with its customers.

A summary by classification of customers served by Reclamation during 1954 is shown in table 10.

The Bureau at the end of fiscal year 1954 had 232 contracts under active negotiation. In this number are included 81 contracts with municipalities, 115 with REA cooperatives, 14 with private utilities, 1 with a public power district, 10 with other Federal agencies, 2 with State authorities, 1 with irrigation districts, and 8 miscellaneous type contracts. A number of these are to renew the existing contracts, or to revise contracts in existence due to changes in operating conditions.

TABLE 10.—*Summary of classification of customers for 12 months ending June 30, 1954* [1]

Type of customers	Number of customers	Sales of electric energy (kilowatt-hours)	Revenues from sales of electric energy
Privately owned utilities	31	4,173,030,838	$14,229,281.86
Municipal utilities	34	1,750,354,290	4,379,330.57
State Government utilities	11	2,420,078,312	7,176,864.02
Cooperative utilities (Rural Electrification Administration projects)	93	619,133,778	3,776,071.47
Other Federal utilities [2]	5	14,595,097,286	16,982,269.71
Residential and domestic	299	5,103,178	29,536.41
Rural (other than Rural Electrification Administration projects)	7	220,104	1,649.46
Commercial and industrial	24	83,111,513	435,197.16
Public authorities	67	702,329,159	2,808,140.85
Interdepartmental	50	722,904,956	993,918.55
Total all customers	621	25,071,363,414	50,812,260.06

[1] Does not include energy sales and revenues in transactions between Bureau projects.

[2] Totals include 14,510,672,904 kilowatt-hours delivered to Bonneville Power Administration for marketing and $16,633,640 in payments by that agency.

PROJECT DEVELOPMENT DIVISION

The project development program provides for the investigation of plans for potential projects for the utilization of the water resources of the West for irrigation and for other purposes. In recent years, the Congress also has made small appropriations of funds to the Bureau of Reclamation for investigations in Alaska relating to the development of water resources as a basis for legislation, and for reports thereon to Congress.

Comprehensive River Basin Surveys

During fiscal year 1954, the Bureau of Reclamation continued the Arkansas-White-Red River Basin investigations in cooperation with other interested Federal agencies under the field committee established by the Federal Inter-Agency River Basin Committee on June 12, 1950.

A report on the Washita River subbasin in Oklahoma and Texas was submitted to the Congress by the Secretary of the Interior with recommendations for construction of Foss and Fort Cobb Dams and Reservoirs on the Washita River in Oklahoma. The report was printed as House document 219, 83d Congress. A bill to authorize these reservoirs had passed the Senate at the end of the fiscal year.

Several other river basin surveys were in progress but none was completed in fiscal year 1954.

New Projects Authorized

The Eklutna project, a power project in Alaska, was reauthorized by act of Congress approved August 13, 1953.

The Interior Department Appropriation Act, 1954, provided funds for emergency rehabilitation of the Avondale and Dalton Gardens projects which are two small private irrigation developments in Idaho.

Project Planning Reports and Authorizing Legislation

At the end of the fiscal year separate bills to authorize the Secretary of the Interior to construct the Santa Margarita project on the Santa Margarita River in California had passed the House and Senate and had been referred to a conference committee.

Reports on the following projects were submitted to the Congress by the Secretary and printed as congressional documents:

Canton project, Oklahoma, House document 445, 83d Congress.
Chief Joseph Dam project, Washington; Brewster Flat, Shoreline Pumping and Bridgeport Bar Divisions, House document 374, 83d Congress.
Colorado River Storage project, and participating projects, Colorado, New Mexico, Utah, Wyoming and Arizona, House document 364, 83d Congress.
  The following 11 participating projects were recommended in this report:
    Central Utah project, Initial Phase, Utah.
    Emery County project, Utah.
    Florida project, Colorado.
    Hammond project, New Mexico.
    La Barge project, Wyoming.
    Lyman project, Wyoming.
    Pine River project extension, Colorado-New Mexico.
    Paonia project, Colorado.
    Seedskadee project, Wyoming.
    Silt project, Colorado.
    Smith Fork project, Colorado.
Rogue River Basin project, Oregon; Talent division, House document 450, 83d Congress.
Santa Maria project, California, House document 217, 83d Congress.

Bills to authorize all of these projects were introduced and hearings were held or were pending in both Houses on all but the bill for the Canton project. The Senate hearings on the Colorado River storage project were still in progress at the end of the fiscal year. The bills on Chief Joseph project and Santa Maria project, as well as a bill to authorize the Ainsworth, Lavaca Flats, Mirage Flats extension and O'Neill units, all in the Niobrara River Basin in Nebraska, as parts of the Missouri River Basin project, had passed the House.

Hearings were held in both Houses on a bill to authorize the Fryingpan-Arkansas project, Colorado, and hearings held in either House or Senate on bills to authorize Michaud Flats project, Idaho; Haystack Regulating Reservoir, north unit, Deschutes project, Oregon; and a permanent diversion for the Palo Verde irrigation district, California. Bills to authorize several other projects were introduced in the Congress but no action had been taken on these bills at the end of the year.

Reports on the Glendo unit, Oregon Trail division, Missouri River Basin project, Wyoming, and the Southwest Contra Costa County water district system, California, were submitted to the Congress by the Secretary pursuant to provisions of recent Interior Department appropriation acts requesting these reports. Subsequently, the House Committee on Interior and Insular Affairs endorsed the plans for the Glendo unit as outlined in the report on that unit, and a joint resolution reauthorizing the Glendo unit was passed by the House.

Also, reports on the following projects were submitted to the Congress by the Secretary during the fiscal year but none of these reports included recommendations for authorization for construction:

Balmorhea project (enlargement), Texas.
Brownwood project, Texas.
Central Valley project (ultimate plan), California Sacramento River Division, Clikapudi unit.
Sequim project, Washington.

The report on the Deschutes project, north unit, Haystack Equalizing Reservoir, Oregon, was reviewed by the Bureau of the Budget, and the report on the Michaud Flats project, Idaho, was submitted to the President and were under review by the Bureau of the Budget at the end of the fiscal year. The report on the Haystack Equalizing Reservoir also was forwarded to the Congress along with the comments of the Secretary on the legislation to authorize its construction.

The reports on the San Luis Valley project, Colorado, Rio Grande and Weminuche Pass divisions, and a reconnaissance report on Susitna River Basin, Alaska, were submitted by the Secretary to the affected States and Federal agencies. Also, a joint Army-Interior report on the Middle Snake River and tributaries in Idaho and Oregon was submitted to the affected States and Federal agencies.

Definite Plan Reports

Definite plan reports were prepared, reviewed, and approved for the following projects or units in fiscal year 1954:

Dalton Gardens project, Idaho.
Eden project, Wyoming (revised).
Middle Rio Grande project, New Mexico, general plan.
Missouri River Basin project:
    Bluff Unit, Wyoming.
    Charley Creek unit, Montana.[1]
    Hanover unit, Wyoming.
    Helena Valley unit, Montana.
    Nickwall unit, Montana.
    Oakes development tract, North Dakota.
Palisades project, Idaho.

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[1] Project not approved for construction under present conditions.

Land Classification

Irrigability classification of lands began with the passage of the Reclamation Act of 1902 and has continued to increase in importance as reclamation irrigation projects have grown in size, complexity, and cost. In 1924, the Second Deficiency Act (Fact Finders' Act) charged the Secretary of the Interior with the responsibility of having the lands on each new project and new division of a project classified with respect to their capacity, under a proper agricultural program, to support a farm family and pay water charges. The act further authorized the Secretary to set definite construction charges against the different classes of land for the purpose of equitably apportioning the total construction costs so that all lands may bear the burden of such costs according to their productive value.

To further assure that these responsibilities would be carried out, the Department of the Interior Appropriation Act for fiscal year ending June 30, 1953, contained the following provision:

> * * * That no part of this or any other appropriation shall be available for the initiation of construction under the terms of Reclamation law of any dam or reservoir or water supply, or any tunnel, canal, or conduit for water, or water distribution system related to such dam or reservoir until the Secretary shall certify to the Congress that an adequate soil survey and land classification has been made and that the lands to be irrigated are susceptible to the production of agricultural crops by means of irrigation.

The same provision was included in the appropriation act for the fiscal year ending June 30, 1954, with the following additional phrase added:

> * * * or that the successful irrigability of those lands and their susceptibility to sustained production of agricultural crops by means of irrigation has been demonstrated in practice.

The provision is interpreted as being a continuing one.

During fiscal year 1954 certifications were made for land-classification surveys completed on 10 projects, divisions, or units. These 10 land-classification surveys covered about 400,000 acres of land in 8 of the 17 Western States. About 225,000 acres of this land were found suitable for irrigation development but were not necessarily all included in plans for development.

River Compacts

The Sabine River compact was ratified by the State of Louisiana (after previous ratification by the State of Texas and signature of the Federal representative). A bill granting the consent of Congress to this compact passed the United States Senate and was introduced into the House.

Preliminary drafts of a proposed Columbia River Basin compact were reviewed and comments furnished through the Secretary of the Interior to the Federal representative.

Hydrologic services in connection with interstate compacts and international treaties were also rendered during the year. These services included advice to the Upper Colorado River Commission in connection with the activities of that group and collaboration with the engineering advisory committee to the Pecos River Commission in evaluating depletions due to salt cedar growth in the Alamogordo-Carlsbad reach of the river.

International Stream Investigations

The Bureau of Reclamation was represented on international engineering boards and a special engineering committee of the United States section of the International Joint Commission and participated in continuing engineering studies for use of the Commission in its consideration of the Waterton-Belly and Souris-Red Rivers references of January 12, 1948, relating to the apportionment of the waters of those international streams between the United States and Canada.

Hydrology

Progress was made on many fronts in basic hydrology dealing with sediment, flood control, water resources and forecasting.

Work on the compilation of water-use data throughout the western United States was continued as part of the authorized research program on water requirements for irrigation.

Continued progress was made in improving techniques for determination of flood potential resulting from snowmelt runoff. A study was prepared utilizing an actuarial approach, involving strictly economic considerations, for determination of spillway design.

Development was completed of a method of day-by-day forecasting of runoff from snowmelt in connection with multiple-purpose reservoir operation.

An interim report on Distributing Sediment in Reservoirs has been prepared and is in the process of duplication. Several new and more simplified procedures are presented therein.

Considerable work was done during the year in connection with the development of hydrologic studies for foreign projects such as those in Thailand, Malaya, Taiwan, and Iran.

Allocation of Costs

A new procedure for the allocation of multiple-purpose project costs was put into effect in the 1954 fiscal year. The procedure was jointly agreed upon and adopted for use by the Department of the Interior, the Department of the Army, and the Federal Power Commission. Under the new procedure a uniform method will be applied to all projects thus eliminating the unsatisfactory circumstance where the three Federal departments frequently arrive at three different answers to the same question.

PROGRAM COORDINATION AND FINANCE DIVISION

The Accounting System

A complete revision of the finance manual was started during fiscal year 1954 and is scheduled for completion in the early part of fiscal year 1955. The revision of the accounting system is aimed at streamlining of procedures, reduction of volume of accounting instructions and consolidation of related sections for ease of reference. Printing of the basic elements of the accounting system in a form comparable to those issued by regulating agencies such as the Federal Power Commission has been deferred until completion of the revision.

Internal operational surveys were conducted in certain offices and, as a result, through rearrangement of duties and functions and improvements in routine operations more efficient operations were effected.

A consolidated financial statement was prepared for the period ending June 30, 1953, which reflected the cumulative financial operations of the Bureau for the past 51 years. The report revealed that the Government's investment in physical plant was approximately $2.5 billion, which is indicative of the Bureau's progress in reclaiming the water and land resources of the country for beneficial purposes. The report also reflected an increase of over $60 million in contracts with water users for repayment of construction costs, and unmatured repayment contracts amounted to over $580 million. In addition over $363 million have been collected from sales of electric power.

Special Assignments

Among the special assignments in which the Systems Section participated was that of resolving All-American Canal problems. Cost allocations of the All-American Canal, for use in repayment negotiations with water users and other interested parties, have been completed and discussions held with the parties concerned. Based on the cost allocation and other policy decisions the Secretary has determined the cost of the canal to each of the participants and issued notices of such determinations to the water users.

Numerous other special assignments were handled, among which was the participation in activities of the Reports Review Committee. As a result of the work of this committee, the reports and related paper work were reduced, resulting in increased economy and efficiency.

Schedules

Integration of the estimating, programing, reporting, and accounting procedures was well established and in active use by the beginning of fiscal year 1954. As a result, it was possible during the year to maintain closer and more effective control of the Bureau's program in accordance with Presidential policies and criteria as well as congressional and budgetary limitations. The Bureau's excellent record in reduction of unobligated balances can, in part, be attributed to this control.

With emphasis on reduced appropriations, programs were constantly reexamined and analyzed and fund transfers effected to make the most efficient use of funds available. Closer attention was paid to the tie-in between apportionments and programs. As programs changed or funds were reallotted, program change orders and reapportionment schedules were required. When necessary, authority was obtained from the Department or the Bureau of the Budget to make changes in the program, and major program changes were brought to the attention of appropriate congressional committees. Programs and funds were under the almost constant scrutiny of the Bureau of the Budget. By maintaining up-to-date program and apportionment schedules, it was possible to answer many inquiries from that Bureau.

Particular attention was devoted during the year to the problem of reconciling acreage data reported in the various program documents with that shown in the annual crop report.

Major objectives in scheduling improvements for fiscal year 1955 include refinement of forms and procedures to reduce to a minimum manpower requirements and to comply with revisions in the Bureau's organization. Special attention will be given to operation and maintenance schedules where possibilities for simplification and more effective control appear most likely.

Budget

Appropriations made available to the Bureau of Reclamation for fiscal year 1954 totaled $143,669,660, exclusive of $4,610,748 in permanent appropriations. This was a decrease of $62,778,331 below appropriations for fiscal year 1953. With an unobligated balance of $42,383,231 plus trust funds, working funds, and funds advanced by water users, the money available for reclamation was $196.4 million. Of this amount, however, $4,230,209 was placed in a budgetary reserve, leaving a net amount programed of $192.2 million. There were additional unobligated funds at the close of 1954 totaling $7.2 million.

Obligations for fiscal year 1954 reached $185.0 million or 96.3 percent of the obligations programed, as compared with 83.2 percent of the program accomplished in 1953.

The 1954 Appropriation Act, as in previous years, imposed certain restrictions upon the Bureau which added somewhat to its administrative problems. As in 1952 and 1953 the Bureau was again prohibited from initiating construction on transmission facilities in areas covered by power wheeling contracts unless the power companies in such areas were unable or unwilling to construct them. The limitation on the amount which may be used for the performance of work by Government forces (force account work) first imposed upon the Bureau in the 1949 Appropriation Act and repeated each year since was included again in the 1954 act. This limitation provided that not to exceed 12 percent of the allotment for any one project with a maximum of $225,000, may be used on any one project or unit of the Missouri River Basin project. Also as in recent years a limitation was placed upon the amount of money that could be expended for information services. By administrative decision this limitation was placed at $15,546.

The amounts appropriated by activity for fiscal year 1954, together with the amounts to be derived from the special and general funds, follow:

TABLE 11.—*Condensed statement of appropriation, fiscal year 1954, exclusive of trust funds*

General investigations	$3, 000, 000
Reclamation fund	(2, 400, 000)
Colorado River Dam fund: Colorado River development fund	(500, 000)
General fund	(100, 000)
Construction and rehabilitation	116, 269, 660
Reclamation fund	(52, 509, 206)
General fund	(63, 760, 454)
Operation and maintenance	19, 500, 000
Reclamation fund	(15, 075, 290)
Colorado River Dam fund	(2, 179, 710)
General fund	(2, 245, 000)
General administrative expenses	4, 500, 000
Reclamation fund	(4, 500, 000)
Emergency fund	400, 000
Reclamation fund	(400, 000)
Grand total	143, 669, 660
Reclamation fund	(74, 884, 496)
Colorado River development fund	(2, 679, 710)
General fund	(66, 105, 454)

Statistics

Under the Commissioner's reorganization plan, the Statistics Branch was officially established to provide central statistical services to absorb the continuing reports work performed by the former Reports Branch.

As planned and developed in previous years through extended research into the Bureau's activities from its inception in 1902 to date, these services consist of (*a*) processing prescribed bureauwide reports required by law, higher authorities and other agencies, relating to the Bureau's various programs, progress, accomplishments, employment, personal services and general administrative expenses; (*b*) compiling and publishing monthly, annual, and periodic releases that maintain a continuous time series of frequently required historical, current and projected data on all phases of reclamation activities, to serve as ready-reference official sources for Bureau data; (*c*) Interpreting inquiries, furnishing requested data and making special studies and reports as required for Bureau management and administrative purposes pertaining to project authorizations; and feasibilities, appropriations, programs, progress, accomplishments, utilization of funds, employment, personal services, investments, construction repayments from irrigation and power revenues.

During the fiscal year, economies were made in processing the prescribed reports by certain eliminations and by reductions in frequency in accordance with recommendations of the Commissioner's Washington Office Survey Committee. Research continued during the year to reestablish time series of data on expenditures, cost and related historical data frequently requested. In addition to responses to numerous requests for various data, special studies were conducted and determinations made on items such as forecasts of program achievements, maximum utilization of funds, effect of ensuing year appropriations on current employment, procedures for carry over forecasts and annual project histories, consistency in reporting of power data, analyses of general administrative expenses including ratio of personal services to total expenditures.

TABLE 12.—*Appropriations from reclamation and other funds, fiscal years 1902–54*

Fiscal year	Reclamation fund		General fund		Colorado River dam fund	Emergency relief funds [2]	Permanent appropriations	Total
	Regular [1]	Power revenue	Regular	Colorado River front work and levee systems				
1902	[3] $165,000							(3)
1903	[3] 5,950,000							(3)
1904	[3] 18,440,000							[3] $2,000,000
1905	[3] 8,758,000							(3)
1906	[3] 24,894,961							[3] 15,363,800
1907	[3] [4] 41,979,161							(3)
1907	19,186,161							[3] 18,051,161
1908	9,562,038							9,562,038
1909	9,180,700							9,180,700
1910	8,183,300							8,183,300
1911	26,896,790							26,896,790
1912	8,262,367							8,262,367
1913	8,300,508							8,300,508
1914	15,931,922							15,931,922
1915	1,261,411							1,261,411
1916	13,530,000							13,530,000
1917	8,887,557		$15,000					8,902,557
1918	8,227,000		310,213					8,537,213
1919	9,397,081		443,196					9,840,277
1920	7,300,000		548,927					7,848,927
1921	8,463,000		661,177					9,124,177
1922	20,266,000		335,871					20,601,871
1923	14,800,000		559,530					15,359,530
1924	13,800,000		314,067					14,114,067
1925	11,890,809							11,890,809
1926	12,563,240			[5] $687,336				13,250,576
1927	7,436,320		40,000	[5] 35,000				7,511,320
1928	12,148,800		15,000	[5] 107,640				12,271,440
1929	14,138,400	$190,000	15,000	100,000				14,443,400
1930	8,253,000	390,000	10,660,000	100,000				19,403,000
1931	9,087,000	395,000		100,000				9,582,000
1932	6,971,000	300,000	25,000,000	100,000				32,371,000
1933	2,442,288	375,000	13,050,000					15,867,288
1934	3,003,000	405,000	8,000,000	48,000		$103,535,000		114,991,000
1935	860,750	316,000				34,076,000		35,252,750
1936	1,022,100	366,000	15,900,000	50,000		25,438,000		42,776,100
1937	12,028,600	316,000	34,850,000		$350,000	[4] 4,873,000		42,671,600
1938	11,991,600	331,000	30,555,000	15,000	500,000	37,047,500	$1,100,000	81,540,100
1939	10,574,600	366,000	32,980,000	15,000	500,000	[4] 2,502,488	4,600,000	46,533,112
1940	13,269,600	606,000	64,200,000	15,000	575,000	28,347	5,700,000	84,393,947
1941	9,429,600	571,000	63,750,000	15,000	768,000	[4] 124,300	6,600,000	81,009,300
1942	7,446,600	664,400	94,245,031	50,000	1,000,000	[4] 19,961	2,600,000	105,986,070
1943	2,651,060	956,900	86,628,565	47,895	1,379,250	[4] 1,131	2,600,000	94,262,539
1944	2,422,500	2,091,975	35,578,000	75,000	1,443,100	[4] 72,709	5,669,468	47,207,334
1945	5,321,000	2,328,800	17,734,200	340,000	2,200,000	[4] 22,332	5,282,501	33,184,169
1946	34,089,290	2,528,600	82,858,000	612,500	2,550,000		4,491,718	127,130,108
1947	36,315,968	3,284,245	75,931,805	100,000	1,814,330	[4] 30,396	4,806,879	122,222,831
1948	20,127,250	5,549,500	115,420,288		2,088,000		5,545,400	148,730,438
1949	29,952,663	6,999,601	227,402,953		2,450,000	[4] 38,319	4,693,475	271,460,373
1950	35,432,720	9,327,097	312,034,175		2,123,100		8,046,265	366,963,357
1951	37,660,175	9,257,190	222,453,635		2,308,000		6,048,668	277,727,668
1952	42,077,837	9,344,510	180,665,175		2,171,000		6,665,088	240,923,610
1953	61,783,400	11,162,050	130,859,541		2,643,000		7,743,965	214,191,956
1954 [6]	63,585,006	11,299,490	65,505,454		2,454,300		4,610,748	147,454,998
Total	753,640,811	79,721,358	1,949,519,803	2,613,371	29,317,080	192,440,211	[7] 86,804,175	3,094,056,809

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[1] Prior to fiscal year 1916 funds were made available to the Reclamation Service by allotments authorized by the Secretary of the Interior.

[2] Emergency relief funds include allocations to reclamation from NIRA, PWA, WPA, and ERA funds.

[3] Allotments made prior to Fallon, Nev., conference on July 27, 1907, were canceled and summary allotments issued. Original amounts excluded from total column.

[4] Credit.

[5] Appropriated to reimburse the reclamation fund for Yuma project expenditures.

[6] Rescission of $600,000 from General Fund and $225,410 returned to Colorado River Dam Fund have been deducted.

[7] Repayment of advances included: Boulder Canyon, $20,084,554.50; and All-American canal system, $1,952,000.

TABLE 13.—*The Reclamation fund, fiscal years 1953–55, funds available for appropriation*

Receipts and appropriations	Actual, 1953	Actual, 1954	Estimated, 1955
Unappropriated balance brought forward (as of June 30)	$74, 719, 171	$78, 234, 263	$88, 033, 070
Add items in transit			160, 366
Accretions and collections:			
Bureau of Reclamation, 100	16, 813, 339	14, 276, 770	13, 110, 000
Other agencies, 200	25, 118, 114	27, 943, 980	34, 573, 500
Power revenues, 300	32, 166, 768	41, 578, 238	45, 370, 000
Subtotal, accretions and collections	74, 098, 221	83, 798, 988	93, 053, 500
Lapsed appropriations	2, 599, 286	995, 063	1, 583, 000
Total available for appropriation	151, 416, 678	163, 028, 314	182, 829, 936
Less permanently authorized appropriations for:			
Refund of revenue collections	225, 000	100, 000	
Farmers irrigation district, North Platte project, Nebraska	11, 965	10, 748	3, 500
Deduct annual appropriation or estimate for:			
General investigations	3, 200, 000	2, 400, 000	3, 150, 000
Construction and rehabilitation	49, 155, 000	52, 509, 206	57, 946, 197
Operation and maintenance	14, 940, 450	15, 075, 290	18, 257, 222
General administrative expenses	5, 250, 000	4, 500, 000	4, 000, 000
Emergency fund	400, 000	400, 000	200, 000
Subtotal, annual appropriation or estimate	72, 945, 450	74, 884, 496	83, 553, 419
Balance carried forward	78, 234, 263	88, 033, 070	99, 273, 017

TABLE 14.—*Accretions to reclamation funds by States, fiscal year 1954*

State or other accretions	Sale of public land		Proceeds from Oil Leasing Act		Total to June 30, 1954
	Fiscal year 1954	To June 30, 1954	Fiscal year 1954	To June 30, 1954	
Alabama			$1, 258. 67	$203, 866. 72	$203, 866. 72
Arizona	$47, 460. 47	$2, 984, 410. 16	59, 502. 35	271, 419. 04	3, 255, 829. 20
Arkansas			6, 893. 38	11, 376. 53	11, 376. 53
California	289, 986. 04	9, 818, 169. 38	4, 589, 835. 67	55, 838, 176. 21	65, 656, 345. 59
Colorado	153, 459. 91	10, 899, 445. 20	4, 025, 862. 04	20, 676, 888. 52	31, 576, 333. 72
Florida				1, 857. 97	1, 857. 97
Idaho	220, 353. 06	7, 790, 468. 47	107, 154. 51	496, 496. 14	8, 286, 964. 61
Illinois			10. 50	42. 00	42. 00
Kansas		1, 041, 529. 43	48, 157. 68	295, 422. 88	1, 336, 952. 31
Louisiana			49, 342. 95	534, 987. 77	534, 987. 77
Michigan			1, 617. 78	22, 878. 22	22, 878. 22
Mississippi			2, 808. 50	10, 933. 91	10, 933. 91
Montana	141, 332. 45	15, 882, 092. 99	1, 406, 461. 59	8, 644, 942. 50	24, 527, 035. 49
Nebraska	30, 792. 69	2, 198, 738. 10	3, 281. 91	48, 443. 13	2, 247, 181. 23
Nevada	19, 449. 91	1, 149, 952. 47	220, 947. 96	1, 456, 714. 18	2, 606, 666. 65
New Mexico	108, 840. 31	7, 128, 623. 79	3, 890, 351. 62	26, 311, 429. 58	33, 440, 053. 37
North Dakota	4, 582. 37	12, 268, 628. 78	80, 147. 10	621, 630. 83	12, 890, 259. 61
Oklahoma	5, 336. 09	5, 968, 525. 24	29, 664. 91	170, 383. 10	6, 138, 908. 34
Oregon	435, 057. 12	13, 877, 531. 34	6, 275. 57	47, 183. 71	13, 924, 715. 05
South Dakota	13, 913. 20	7, 773, 058. 05	88, 866. 01	350, 554. 23	8, 123, 612. 28
Utah	70, 191. 80	4, 715, 160. 40	1, 423, 374. 67	7, 563, 679. 45	12, 278, 839. 85
Washington	151, 312. 29	8, 335, 712. 81	1, 986. 97	59, 399. 79	8, 395, 112. 60
Wyoming	77, 967. 50	9, 278, 997. 36	8, 717, 435. 96	91, 881, 844. 66	101, 160, 842. 02
Total	1, 770, 035. 21	121, 111, 043. 97	24, 761, 238. 30	215, 520, 551. 07	336, 631, 595. 04

OTHER ACCRETIONS

	Fiscal year 1954	Totals to June 30, 1954
Proceeds, Federal water power licenses	$14, 571. 53	$1, 343, 610. 06
Proceeds, potassium royalties and rentals	1, 267, 105. 76	7, 889, 117. 68
Receipts from Naval Petroleum Reserves, 1920–38, act of May 9, 1938		29, 778, 300. 23
Proceeds from rights-of-way over withdrawn lands, act of July 19, 1919	(4, 204. 65)	11, 372. 52
Lease of lands	21, 924. 73	90, 255. 13
Town lot sales	67, 285. 47	795, 485. 18
Timber sales, and other miscellaneous items	46, 023. 80	310, 380. 67
Total	1, 412, 706. 64	[1] 376, 850, 116. 51

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[1] Grand total.

TABLE 15.—*Cost of plant, property and equipment, by States, June 30, 1954*

State and project	Completed works					Construction in progress	Other physical property	Total
	Multi-purpose (1)	Irrigation (2)	Electric (3)	Municipal water (4)	Flood control (5)	(6)	(7)	(8)
Total	$956, 359, 524	$703, 821, 206	$500, 095, 887	$13, 990, 834	$13, 182, 992	$348, 292, 648	$20, 250, 647	$2, 555, 993, 738
Alaska: Eklutna			1, 891, 806			23, 865, 336		25, 757, 142
Arizona, subtotal	90, 437, 557	49, 018, 594	103, 296, 232		3, 438, 729	14, 361, 938	66, 317	260, 619, 367
Boulder Canyon:								
All-American Canal system (California)	2, 179, 950							2, 179, 950
Hoover Dam and powerplant (Nevada)	44, 543, 209		33, 371, 951			273, 565		78, 188, 725
Colorado River front work and levee system (California-Nevada)					3, 438, 729	70, 303		3, 509, 032
Davis Dam (Nevada-California)	35, 095, 082		60, 386, 003			2, 734, 926		98, 216, 011
Gila		33, 784, 836				6, 718, 580	66, 317	40, 569, 733
Parker Dam power (California-Nevada)	3, 394, 426		5, 241, 247			144, 197		8, 779, 870
Salt River	5, 224, 890	10, 753, 356	4, 266, 443			4, 386, 613		24, 631, 302
Yuma (California)		2, 426, 624	30, 588					2, 457, 212
Yuma Auxiliary		2, 053, 778				33, 754		2, 087, 532
California, subtotal	283, 038, 557	90, 435, 200	84, 855, 874		9, 321, 412	91, 873, 336	4, 085, 808	563, 610, 187
Boulder Canyon: All-American Canal system (Arizona)	38, 465, 219	16, 487, 976	45, 091		3, 329, 786	66, 735		58, 394, 807
Cachuma	22, 153, 769					13, 504, 610		35, 658, 379
Central Valley	216, 978, 879	62, 090, 503	66, 057, 116			74, 912, 338	4, 085, 808	424, 124, 644
Colorado River front work and levee system (Arizona-Nevada)					5, 991, 626	218, 498		6, 210, 124
Davis Dam (Arizona-Nevada)			6, 554, 927			111, 193		6, 666, 120
Klamath (Oregon)		6, 307, 524				84, 155		6, 391, 679
Orland		2, 581, 402				426		2, 581, 828
Parker Dam power (Arizona-Nevada)	5, 440, 690		11, 793, 950			68, 760		17, 303, 400
Solano						2, 882, 845		2, 882, 845
Truckee storage (Nevada)								
Yuma (Arizona)		2, 967, 795	404, 790			23, 776		3, 396, 361
Colorado, subtotal	45, 497, 408	96, 592, 648	29, 073, 884			26, 960, 226		198, 124, 166
Colorado-Big Thompson	28, 462, 889	71, 634, 277	28, 423, 390			24, 889, 263		153, 409, 819
Fruitgrowers Dam		200, 309						200, 309
Grand Valley		6, 867, 055	213, 669					7, 080, 724
Mancos		3, 895, 274						3, 895, 274
Missouri River Basin	13, 217, 589		436, 825			1, 018, 040		14, 672, 454

Paonia		1, 566, 713				34, 808		1, 601, 521
Pine River		3, 463, 061						3, 463, 061
San Luis Valley	3, 816, 930					1, 018, 115		4, 835, 045
Uncompahgre		8, 965, 959						8, 965, 959
Idaho, subtotal	45, 508, 485	37, 752, 680	8, 936, 931	1, 020, 096		30, 678, 728		123, 896, 920
Avondale						36, 892		36, 892
Boise (Oregon)	36, 382, 433	21, 380, 180	6, 237, 065			330, 191		64, 329, 869
Dalton Gardens						39, 264		39, 264
King Hill		1, 877, 732						1, 877, 732
Lewiston Orchards	426, 999	1, 037, 300		1, 020, 096				2, 484, 395
Minidoka (Wyoming)	8, 699, 053	11, 622, 808	2, 699, 866			1, 430, 710		24, 452, 437
Owyhee (Oregon)		902, 000						902, 000
Palisades (Wyoming)						28, 841, 671		28, 841, 671
Preston Bench		450, 300						450, 300
Rathdrum Prairie		482, 360						482, 360
Iowa: Missouri River Basin Transmission Lines						1, 676, 428		1, 676, 428
Kansas, subtotal	13, 633, 349	334, 475				17, 288, 763		31, 256, 587
Garden City		334, 475						334, 475
Missouri River Basin	13, 633, 349					17, 288, 763		30, 922, 112
Minnesota: Missouri River Basin Transmission Lines						198, 608		198, 608
Montana, subtotal	94, 457, 054	30, 146, 878	42, 596, 004			21, 276, 849		188, 476, 785
Bitter Root		955, 051				39, 055		994, 106
Buffalo Rapids		4, 028, 474				401, 052		4, 429, 526
Fort Peck (North Dakota)			8, 959, 078			759, 240		9, 718, 318
Frenchtown		290, 797						290, 797
Hungry Horse	74, 680, 170		25, 152, 014			1, 189, 175		101, 021, 359
Huntley		1, 552, 159						1, 552, 159
Intake		92, 371						92, 371
Lower Yellowstone (North Dakota)		3, 077, 537						3, 077, 537
Milk River		8, 939, 375				724, 894		9, 664, 269
Missoula Valley		278, 321						278, 321
Missouri River Basin	19, 776, 884	1, 027, 487	8, 484, 912			18, 058, 869		47, 348, 152
Shoshone (Wyoming)		16, 400						16, 400
Sun River		9, 888, 906				104, 564		9, 993, 470
Nebraska, subtotal	36, 619, 441	24, 405, 649	5, 325, 903			18, 907, 086		85, 258, 079
Mirage Flats		3, 044, 837				56, 884		3, 101, 721
Missouri River Basin	36, 619, 441	12, 434, 482	5, 111, 395			18, 844, 619		73, 009, 937
North Platte (Wyoming)		8. 926, 330	214, 508			5, 583		9, 146, 421

TABLE 15.—*Cost of plant, property and equipment, by States, June 30, 1954*—Continued

State and project	Completed works					Construction in progress	Other physical property	Total
	Multi-purpose (1)	Irrigation (2)	Electric (3)	Municipal water (4)	Flood control (5)	(6)	(7)	(8)
Nevada, subtotal	$53, 358, 744	$9, 861, 880	$35, 320, 814		$158, 921	$380, 281	$7, 073, 722	$106, 154, 362
Boulder Canyon:								
Hoover Dam and power plant (Arizona)	49, 928, 783		31, 260, 390			259, 221	1, 614, 553	83, 062, 947
Boulder City Municipal Office						569	5, 459, 169	5, 459, 738
Colorado River front work and levee system (Arizona-California)					158, 921			158, 921
Davis Dam (Arizona-California)	3, 429, 961		3, 713, 714			120, 491		7, 264, 166
Humboldt		1, 214, 321						1, 214, 321
Newlands		7, 555, 136	344, 343					7, 899, 479
Parker Dam (Arizona-California)			2, 367					2, 367
Truckee Storage (California)		1, 092, 423						1, 092, 423
New Mexico, subtotal	9, 736, 392	27, 918, 435	7, 643, 807		263, 930	5, 727, 413	5, 050	51, 295, 027
Carlsbad		4, 242, 363				837		4, 243, 200
Fort Sumner		2, 427, 292					5, 050	2, 432, 342
Hondo		371, 788						371, 788
Middle Rio Grande	1, 605, 543					3, 628, 072		5, 233, 615
Rio Grande (Texas)	8, 130, 849	5, 547, 253	7, 643, 807		263, 930	148, 618		21, 734, 457
Tucumcari		15, 329, 739				181, 059		15, 510, 798
Vermejo						1, 768, 827		1, 768, 827
North Dakota, subtotal	7, 919, 587	2, 599, 447	17, 868, 462			4, 790, 527		33, 178, 023
Buford-Trenton		942, 607						942, 607
Fort Peck (Montana)			1, 313, 667			159, 925		1, 473, 592
Lower Yellowstone (Montana)		555, 682						555, 682
Missouri River Basin	7, 919, 587	692, 063	16, 554, 795			4, 630, 602		29, 797, 047
Williston		409, 095						409, 095
Oklahoma: W. C. Austin	6, 955, 968	5, 565, 712		$152, 026				12, 673, 706
Oregon, subtotal		48, 858, 670	515, 304			942, 820	13, 845	50, 330, 639
Arnold								
Baker		281, 589						281, 589
Boise (Idaho)		4, 275						4, 275
Deutessch		11, 635, 160	515, 304			60, 921		12, 211, 385
Burnt River		601, 026						601, 026

Grants Pass						566,121		566,121
Klamath (California)		7,944,190				315,778	13,845	8,273,813
Ochoco								
Owyhee (Idaho)		18,215,602						18,215,602
Umatilla		5,310,004						5,310,004
Vale		4,866,824						4,866,824
South Dakota, subtotal	17,792,269	4,697,840	13,099,127			21,518,279	53,548	57,161,063
Belle Fourche		4,665,477				393,904		5,059,381
Missouri River Basin	16,864,943	32,363	13,099,127			21,124,375	53,548	51,174,356
Rapid Valley	927,326							927,326
Texas, subtotal	23,499,080	5,432,100	464,801			62,812		29,458,793
Balmorhea		407,741						407,741
Colorado River	23,499,080		464,801					23,963,881
Rio Grande (New Mexico)		4,843,731				62,812		4,906,543
Rio Grande River rectification		180,628						180,628
Utah, subtotal	14,957,101	19,562,038	91,969	12,818,712		5,935,614	61,085	53,426,519
Hyrum		953,854						953,854
Moon Lake		1,799,859						1,799,859
Newton		712,592						712,592
Ogden River		5,013,284						5,013,284
Provo River	14,957,101	3,632,847		12,818,712		467,600		31,876,260
Sanpete		433,940						433,940
Scofield		943,837						943,837
Strawberry Valley		3,345,940	91,969				61,085	3,498,994
Weber Basin						5,468,014		5,468,014
Weber River		2,725,885						2,725,885
Washington, subtotal	167,001,004	196,481,502	108,643,356			47,004,723	4,259,656	523,390,241
Columbia Basin	162,556,039	155,769,997	107,363,586			42,341,444	4,259,656	472,290,722
Okanogan		1,484,324				21,305		1,505,629
Yakima	4,444,965	39,227,181	1,279,770			4,641,974		49,593,890
Wyoming, subtotal	45,947,528	53,933,975	40,471,613			14,842,881		155,195,997
Eden		2,638,173				1,332,110		3,970,283
Kendrick	5,159,169	9,424,616	8,548,473			6,156,983		29,289,241
Minidoka (Idaho)		2,170,665						2,170,665
Missouri River Basin	32,676,359		26,749,760			4,216,116		63,642,235
North Platte (Nebraska)	3,256,060	8,169,783	1,260,604			197,837		12,884,284
Palisades (Idaho)						189,556		189,556
Riverton	2,970,469	16,440,882	466,121			1,455,162		21,332,634
Shoshone (Montana)	1,885,471	15,089,856	3,446,655			1,295,117		21,717,099
Nonproject property		223,483					4,631,616	4,855,099

NOTE.—Name of State in which balance of project is located is indicated by parentheses. Irrigation plant listed at gross construction cost prior to deduction of chargeoffs authorized by Congress.

COMPTROLLER

The Bureau's program of enforcement of financial policy and internal and external audit activity was intensified during the 1954 fiscal year.

To attain maximum utility and prompt recognition of audit disclosures, a summary letter report of the auditor's findings was adopted. This type of report immediately places before management the more important disclosures, particularly those requiring corrective action. A program of prompt issuance of audit reports immediately after close of examinations was prescribed. Onsite field review by a supervising auditor of the findings and report structure during the course of the audit examination is speeding up report production and frees the auditor for new assignments. Maximum utilization of staff is thus obtained through reassignment of the auditors to new examinations upon completion of their assignments.

During the year the Comptroller's office completed a comprehensive audit and special cost allocation study of the Yuma and Yuma Auxiliary projects.

A special audit of irrigation operations since 1943 of the Gila project was completed to establish results of operations and provide data for cost allocations under repayment contracts.

The office of Comptroller was designated to supervise and direct the audit work at the Boulder Canyon project incident to the determination of nonproject costs pursuant to Public Law 841. The several studies being made as an adjunct to this assignment also will develop factual data needed to resolve other Boulder Canyon project problems.

LEGAL

Pursuant to the reorganization of the Solicitor's office, the office of the Associate Solicitor, Reclamation and Power, was established. The responsibility of that office includes the legal phases of matters arising in connection with the programs and activities of the Bureau of Reclamation.

The Associate Solicitor supervises the work of the Assistant Solicitor, Reclamation, who is initially responsible for all legal matters connected with the work of the Bureau. As heretofore, attorneys assigned to this task have participated in the solution of the sundry legal problems of the Bureau of Reclamation in such varied fields as construction, supply contracts and contract administration, negotiation of repayment contracts, problems connected with the generation and disposition or purchase of electric power and energy, condemnation proceedings, tort matters, and advice on daily operations problems. The principal legislation and litigation and claims are discussed below.

Legislation

Of the legislation affecting the Bureau of Reclamation enacted during the fiscal year 1954, the most far-reaching was the act of August 13, 1953 (Public Law 258, 83d Cong.) relating to the exchange and amendment of farm units on Federal reclamation projects. In addition to covering these matters, the new act (which replaces subsection M of the 1924 Fact Finders' Act) permits the establishment of public land farm units containing maxima of 160 irrigable acres and 320 acres in all.

The fiscal year 1954 also saw the enactment of bills consolidating the Parker and Davis projects (Public Law 373), terminating the interest of the Shoshone and Arapahoe Indian tribes in certain lands on the Riverton project and providing compensation therefor (Public Law 284), approving amendatory repayment contracts with the Hermiston, West Extension, and Roza districts (Public Law 404, Public Law 462), providing for the marketing of power produced at the International Boundary and Water Commission's Falcon Dam (Public Law 406), and increasing the amount authorized to be appropriated for construction of the Eklutna project (Public Law 260).

No bills authorizing the construction of new projects were enacted during the fiscal year, but a number were in the last stages of congressional consideration on June 30 and were enacted shortly thereafter.

Litigation

1. *Rank* v. *Krug*, *et al.*, the complaint in this case originally was filed in 1947 in the superior court of the State of California in and for the county of Fresno. Upon the motion of the Department of Justice the case was removed to the United States District Court for the Southern District of California, Northern Division. At about the same time, four other actions were filed for similar relief against the same parties. These actions also were removed to the same United States district court.

The court has jurisdiction of four of the named defendant officials of Region 2 of the Bureau of Reclamation, including the Regional Director. A number of irrigation districts in the Friant-Kern Canal and Madera Canal areas also are defendants. The State of California, through its attorney general, and the city of Fresno are intervenors in the case. The plaintiffs also filed separate suits in the same United States district court for compensation under the Tucker Act.

All of these suits directly involve the water rights of a class alleged from time to time to comprise 1,400 landowners claimed to be affected by the operation of Friant Dam and Reservoir.

The plaintiffs claim, as a class, that they own riparian, apprropriative, prescriptive, and ground water rights to the full flow of the San Joaquin River, unrestricted by operations by the United States. For their use they seek an absolute injunction against the operation of Friant Dam and its diversion works. In the alternative, they request a regulated flow of the river to simulate the optimum conditions that a flow of 2,500 cubic feet per second would provide for downstream water users at any time that such water is available in Friant Reservoir. As a second alternative, they request a physical solution to simulate a flow of 2,000 cubic feet per second, plus the installation and operation of some 14 check dams in the river, which would cost several million dollars. As a third alternative, the plaintiffs request relief by way of "reverse condemnation," as that term is used by the California courts.

As against these pleas of the plaintiffs, the defendants have interposed a general denial and have submitted plans for physical solutions of the problems.

In early 1950, motions for a preliminary injunction and to dismiss (except as to the Tucker Act cases) were consolidated and heard at Los Angeles. Both motions were denied, except that in one of the incidental cases the motion to dismiss was granted. The decision on these motions is reported in *Rank* v. *Krug*, 90 F. Supp. 773 (1950).

During July and August 1951, further hearings were held at Fresno on a renewed motion for a preliminary injunction. The result was a stipulated order covering phases of the operation of the river for a limited period of time.

In December 1951 and January 1952, pretrial hearings were held, an order was made thereon, and the case was set for trial to begin at Fresno on January 29, 1952. The trial was concluded during July of 1953.

In the spring of 1953 an order was entered requiring certain releases from Friant Dam. The United States went into the circuit court and in an opinion dated August 4 this order was dissolved. The basis of the decision was that the order affected property of the United States and that the United States was not a party. Subsequently during August the plaintiffs moved to join the United States as a party and to reopen the trial. The United States was joined by order of the court on September 18, 1953. The United States then applied to the circuit court for a motion to restrain further proceedings in the case and to dismiss the United States as a party. On February 1, 1954, the court denied the motion. The basis of the denial was to the effect that after such a long trial it would be premature to consider the issues raised in a special proceeding and that the issues could be considered on appeal. Motion to reopen the trial is still pending.

2. *In the Matter of the California Oregon Power Co.*, on April 16, 1951, Copco filed an application with the Federal Power Commission for a license for its proposed Big Bend No. 2 project, identified by the Federal Power Commission as project No. 2082. The Secretary of the Interior following his recommendation to the Commission that the application be denied for the reasons that it might impair the rights to water of the United States, would be detrimental to irrigation and development of land in the Klamath project, and would foreclose comprehensive water resource development in the Klamath River Basin was formally admitted as a party to the proceeding and to a companion proceeding. (Docket No. E–6390, discussed separately.)

The Presiding Examiner's Recommended Decision on project No. 2082 (October 2, 1953) recommended that Copco be granted a license subject to the condition that within 1 year the company should obtain an extension or renewal, for the 50-year term of the license, of the 1917 contract with the United States covering the operation of Link River Dam. The company filed exceptions to the recommended decision on the ground that the trial examiner erred in determining that the Commission had jurisdiction on the basis of the company's use of surplus water from a Government dam. The Department did not file exceptions but appeared at the hearing before the Commission on December 1, 1953. The purpose of the appearance was to counter statements made in Copco's exceptions negativing the water rights of the United States. On January 28, 1954, the Commission issued its opinion No. 266 affirming the recommended decision of the trial examiner. Copco's petition for a rehearing was denied. Copco has appealed this decision to the United States Court of Appeals for the District of Columbia, No. 12235.

3. *In the Matter of the California Oregon Power Co.*, this proceeding is a companion to project No. 2082 and was commenced by an order to show cause, issued November 28, 1951, to Copco by the Federal Power Commission. The order required Copco to show cause why it should not file applications for licenses for five of its existing hydroelectric plants on the Klamath River in Oregon and California.

The main issues in this proceeding are whether the Commission has licensing jurisdiction over the five plants, and, assuming that the Commission does have jurisdiction, on what particular ground it should be based. Staff counsel for the Commission contended that several bases of jurisdiction exist, among others, that the plants utilize surplus water from a Government dam.

The dam in question is the Link River Dam, constructed by Copco in 1917 pursuant to a 50-year contract between Copco and the Bureau of Reclamation. In essence, the contract provided for the construction of the Link River Dam by Copco and the transfer thereof to the United

States, the operation of Link River Dam by Copco to meet certain irrigation requirements of the Klamath project, and the reduction, by Copco, of certain power rates for pumping in the Klamath project. Thus, although the primary purpose of the dam is to provide water for irrigation of the Klamath project, Copco may also make limited releases of water for the generation of power. Copco has 2 plants at Klamath Falls, 1 at Keno, Oreg., and 2 near Copco, Calif., all of which are operated through water releases from Link River Dam.

The presiding examiner's recommended decision on docket No. E–6390 (Oct. 2, 1953) holds that the Commission has jurisdiction under the Federal Power Act on grounds, among others, that the plants utilize surplus water from Link River Dam. Although originally opposing this particular ground of jurisdiction, the Secretary of the Interior did not file exceptions to the recommended decision because, in effect, the interests of the United States are protected by the condition to the license imposed in project No. 2082. Copco, however, filed exceptions and, for reasons indicated in the discussion of project No. 2082, the Department appeared at the hearing before the Commission on December 1, 1953. The Commission's decision No. 266 (Jan. 28, 1954) affirmed the "surplus water" as a jurisdictional basis for license and Copco has appealed this decision to the United States Court of Appeals for the District of Columbia, No. 12236.

4. In connection with the action *State of Arizona* v. *State of California, et al.*, in the Supreme Court of the United States leave to intervene was granted in January 1953 on the motion of the United States. Pursuant thereto, petition of intervention on behalf of the United States of America was filed December 8, 1953. Motion on behalf of the State of Nevada for leave to intervene and petition of intervention on behalf of the State of Nevada were also filed with the Court during December 1953. Thereafter, answers to said motion and petition were separately filed by the States of Arizona and California. Shortly before the close of the fiscal year, the Court appointed a special master in the case.

By this action the State of Arizona seeks a determination of its rights in and to the use of the waters of the Colorado River, as against such rights claimed by the defendants under the Colorado River compact, the Boulder Canyon Project Act, and the California Limitation Act.

5. The action entitled *United States* v. *Coachella Valley County Water District*, in the United States District Court, Southern District of California, Central Division (Los Angeles), was instituted to obtain a declaratory judgment to determine the respective rights and obligations of the parties under their contract of December 22, 1947,

for construction of the lateral distribution system and other works, Coachella division, All-American Canal system, particularly as to whether or not the district was liable for increased construction costs over and above $13 million, the amount specified in the contract. On March 12, Judge Westover rendered his opinion finding against the United States. Thereafter, motion for new trial was overruled and notice of appeal was filed December 9, 1953. On January 29, 1954, pursuant to stipulation of the parties, an order dismissing said appeal was entered and the case closed.

6. *Hudspeth County and Reclamation District No. 1* v. *Robbins, et al.* (an employee of the Bureau), a suit for declaratory judgment to establish the water rights of the plaintiff and to enjoin officers of the United States from impounding and diverting certain waters allegedly belonging to the district was originally filed in the district court for Hudspeth County, Tex., and later removed to the United States District Court, Western District of Texas, El Paso Division. On the plaintiff's motion for partial summary judgment and on the defendant's motion for summary judgment, the Court ordered that relief sought by the plaintiff be denied. The case was appealed, and following oral hearings, remanded with directions to dismiss the complaint for want of jurisdiction. Plaintiff has notified the defendant of its intent to file a petition for a writ of certiorari in the Supreme Court of the United States.

7. *El Paso County Water Improvement District No. 1 and the United States, et al.* v. *The City of El Paso*, was filed in the United States District Court, Western District of Texas, El Paso Division, in January 1953, to resolve a number of controversies existing between the litigants, including the extent of certain alleged water rights of the city, the validity of obligations previously entered into, the validity of conveyances of the Franklin Canal right-of-way, and obligations for maintenance of bridges. Several hearings have been held for discovery purposes. At the end of the fiscal year, the trial date has not been set.

8. Two cases, both entitled *Provo Bench Canal & Irrigation Company et al.* v. *Linke, State Engineer, and the United States*, to review decisions of the State engineer approving applications by the United States to change the point of diversion and place of use of water acquired by the United States for the Provo River project, were tried on their merits in the District Court of the Fourth Judicial District in and for Utah County, State of Utah. At the close of the fiscal year, the cases were under advisement.

9. The case of the *United States* v. *Alpine Land & Reservoir Company* for adjudication of water rights on the Carson River, Nevada and

California, is pending in the United States District Court for the District of Nevada, on objections to a proposed decree and petition to reopen for the introduction of additional evidence. The case has been pending for 29 years.

10. *Desert Beach Corporation* v. *United States Imperial Irrigation District; Coachella Valley County Water District; et al.*, was filed in the United States District Court for the Southern District of California, Central Division, in October 1953. This is an action seeking to recover $450,000 in damages to plaintiff's properties alleged to have been caused by the negligent and wrongful acts or omissions of the defendants. On April 12, 1954, an order was entered dismissing the United States from the above action on the ground that plaintiff's complaint failed to allege any specific act of negligence by Government employees acting in the course of their employment. Motions by the Imperial and Coachella districts for dismissal on the ground of lack of diversity of citizenship were taken under advisement by the court. On June 2, 1954, plaintiff filed its first amended complaint and the United States thereafter again moved to dismiss the action on the ground that the amended complaint fails to allege any specific act of negligence on the part of Government employees and also based on the "discretionary act" provision (28 U. S. C. A. 2680) of the Federal Tort Claims Act.

11. *Atchison, Topeka and Santa Fe Railway Company* v. *United States*, petition was filed in the court of claims in February 1954 for damages allegedly arising in connection with the construction of Elephant Butte Dam from heavy siltation and sedimentation in the San Marcial area. Answer was filed on June 9, 1954.

12. The following cases are pending in the court of claims involving the claims of contractors against the United States for alleged increased costs, liquidated damages, damages for delays, and exhaustion and shortage of funds: *Peter Kiewit Sons Co. et al.* v. *United States*, No. 283–52; *Abbett Electric Corp.* v. *United States*, No. 591–53; *Winston Brothers Company et al.* v. *United States*, Cong. 6–52; *A. S. Schulman Electric Co.* v. *United States*, No. 234–53; *D. J. Killoren* v. *United States*, No. 625–53.

13. Various other actions relating to application for the appropriation of water, condemnation proceedings, and tort claims affecting the Bureau of Reclamation were settled, continued, or filed during the fiscal year.

14. Contested validation proceedings involving the Ivanhoe and Madera irrigation districts and the Santa Barbara County Water Agency are in the appeal stage before the Supreme Court of California.

ORGANIZATION AND METHODS DIVISION

The Bureau of Reclamation organization and procedures were streamlined in the 1954 fiscal year in order to accomplish its work more effectively and at less cost.

All work of a technical nature relating to project development, irrigation and power was transferred to the office of the assistant commissioner and chief engineer, Denver, Colo. The activities of the Washington office of the Commissioner were limited to matters of broad policy and liaison, a number of the Washington office functions being eliminated and others consolidated.

The regions of the Bureau were reorganized to place greater emphasis on the engineering responsibilities of the Bureau—the construction and operation of essential irrigation and power projects.

The administrative service activities of the Bureau were drastically reduced and the functions consolidated wherever practicable.

Plans were developed and instituted for a complete revision of the Bureau's administrative release system. Under these plans the former voluminous Reclamation Manual will be replaced by a single document in which will appear the basic Bureau organization, the delegations of authority to subordinate officials, and the policy guide lines by which Bureau officials will conduct Bureau operations. Supplementing this one-volume executive handbook will be a limited number of procedural handbooks which will guide the technical specialists in the performance of their work. This revised system is expected to provide effective instructions at substantial savings in printing, distribution, and other costs.

The incentive awards program, through which employees are encouraged to improve Bureau operations, continued to receive attention. During the year, 330 employee suggestions were processed, of which 130 or 39.4 percent were adopted. For these suggestions employees were paid $5,210. These suggestions represented a savings of $123,388 to the Bureau and resulted in improved procedures and better performance of Bureau's work. Superior accomplishment awards were granted to 53 employees for the development of ideas which promoted economy in Bureau operations or for superior performance of duties. In addition, five awards were granted by the Secretary to Bureau employees for improvements in their operations, resulting in $267,903 savings. While the total dollar savings from all phases of the incentive awards program amounted to $392,791, substantial additional intangible benefits accrued to the Bureau through better working procedures, improved working conditions, the promotion of safety on the job, and better employee morale which results from the performance of duties more economically and effectively.

PERSONNEL DIVISION

Bureau employment dropped from 11,665 full-time employees at the beginning of the year to 10,349 at the end. The decrease was gradual throughout the year and much of it was accomplished by not filling vacancies. There were, however, a number of reductions in force as reorganizations were accomplished or projects completed.

Personnel offices were reorganized as part of the overall Bureau reorganization. The safety function was transferred from the Personnel Division in Washington to the office of the assistant commissioner and chief engineer in Denver. The Personnel Field Division in Denver was abolished. Some personnel operations of a bureauwide nature will continue to be performed in Denver including report and analysis of monthly employment forecasts, central control rosters of personnel, central applicant supply files, and the operation of the central board of civil-service examiners. Other bureauwide functions formerly performed by the Personnel Field Division were transferred to the Washington Office.

With the marked decrease in total employment, only limited recruitment in the lower grades was necessary. It was virtually impossible to recruit beginning engineers. The Bureau, however, continued its college relations program by sending representatives to visit colleges in the western states and taking every opportunity to keep the Bureau's engineering story before faculty members and students. During the year the central board of the civil-service examiners had examinations opened to engineers, engineering aids, draftsmen, and construction inspectors. The Board processed 431 applications, leading to 52 placements.

The personnel management review and improvement program, as well as some training and development activities, was suspended during the reorganization.

Throughout the Bureau extensive position classification review was performed and subsequent realignment of duties and revision of position requirements accomplished. This was necessitated by program changes and reorganization of the Bureau. Reviews of proposed Civil Service classification standards continued to be made, and a new set of standards covering irrigation operations was developed and submitted to the Commission for approval. The regional offices of the Civil Service Commission conducted no classification audits during the fiscal year in field offices, but substantial negotiation continued with some offices in connection with Civil Service Commission audits performed last year.

PROCUREMENT AND PROPERTY MANAGEMENT DIVISION

Bureau reorganization during the year resulted in combining the offices of the Director of Supply, Washington, and the Supply Field Division, Denver, into the Procurement and Property Management Division, Washington. Key personnel of the Supply Field Division in Denver were transferred to the Washington office. This consolidation is expected to bring about a more unified management and direction of activities and accomplish a closer liaison with the Department in the promulgation and implementation of supply policies and directions.

Total volume of procurement awarded by purchase orders and contracts by the Bureau for fiscal year 1954 approximated $18,577,000, compared with a volume of $26,584,000 for the preceding fiscal year. A reduction in personnel engaged in purchasing activities of 33 percent was effected during the year, while the total number of purchase actions decreased only 21 percent. Increased efficiency resulted from adoption of simplified purchase methods. The decrease in procurement activity has been more than offset by the number of sales of surplus property occasioned by an accelerated disposal program within the Bureau.

Personnel changes had little effect on the personal property disposal program and volume was maintained at about the same level as the preceding year. A total of $2,585,169 (original cost) in personal property was sold with a cash return of $513,457 (20 percent). In addition, several hundred thousand dollars worth of property was transferred within the Bureau and departmental agencies, thus increasing utilization within the Government service of property for which the owning agency had no further requirement.

GENERAL SERVICES DIVISION

Established under the Bureau reorganization program, General Services Division operations during the 1954 fiscal year included administrative control over reclamation records management; communication; publications; duplicating, printing and distribution; still and motion picture films; stenographic and typing services; library activities; correspondence; space management and utilization; and other related functions.

Positive measures were taken during the year to make requested file material quickly available. Revisions and extensions of the standard correspondence file system were made to keep file procedure in step with administrative requirements. Material not likely to be required in current operations was transferred from active to inactive files. Both active and inactive files are recurringly purged to eliminate material which has lost its administrative and research values.

Steps were taken to discontinue the Bureau's records service center in Denver, and to utilize the facilities of the Federal records center at that point for the storage of inactive field records.

A program was initiated for storage in the Denver Federal records center of completed land acquisition case files and related original land title papers. Approximately 200 cubic feet of these records were transferred from the National Archives in Washington to the Denver center.

As of June 30, 1954, Bureau volume totaled 124,304 cubic feet; useless records destroyed totaled 10,679 cubic feet; and 4,468 cubic feet of records were transferred out of Bureau custody, consisting mostly of inactive records stored at Federal records centers.

To a large extent, the Bureau's individual teletype system was discarded for the system provided by the General Services Administration—the PBS system.

By resorting to this service, the Bureau in Washington, D. C., alone cut its communication cost by 30 percent, and greatly reduced the time required to transmit messages to the field. Savings also accrued to the field.

The cost of long distance telephone communication was reduced 66 percent at Washington, D. C.

Various actions were taken to improve the Bureau's communication handling procedures, including steps to effect economies in postage costs due to departmental decision to prepay postage on its mailings.

Publications

Responsibility in the field of processing entailed review and correction of the layout and design for any complicated publication originating in the Bureau in Washington and produced in the departmental plant. The result was an appreciable improvement in the appearance of such publications at cheaper production cost.

The Bureau received 1,349 requests at Washington, D. C., for publications and, in response, distributed 12,104 copies. Of this number, 138 were congressional requests for 694 publications. Most out-of-the-Bureau requests were from the other Government agencies. The Department of State requested many titles to supply foreign demands.

Publications distributed from Denver, Colo., the Bureau's chief distribution point, totaled more than 4,500, in addition to 18,000 pamphlets and reports. Sales of Bureau publications sold for the Superintendent of Documents totaled $4,430. Nearly 65 percent of the sales were made to citizens of other countries.

Six hundred ninety-two films were distributed from Washington to television stations, agricultural and engineering groups at universities and colleges, other educational institutions, water users' associations, organizations of farmers, conventions, foreign countries, foreign visitors, and others. A policy was established which enables the Bureau to ship films by fourth-class parcel post under the cheaper book rate which will save borrowers approximately $1,500 per year and cost the Bureau less than shipping by express.

The Bureau at Washington received 164 requests for 1,645 photographs to illustrate Bureau publications, encyclopedias, various agricultural and engineering magazines, and newspapers.

Bonneville Power Administration

William A. Pearl, *Administrator*

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FINANCIAL RESULTS OF OPERATIONS

PRECIPITATION throughout the Pacific Northwest was above the annual average during fiscal year 1954. Consequently stream flows in the Columbia River Basin were very favorable and resulted in increased power output at the dams. Another reason for the increase was the installation of nine additional generating units at Big Cliff, Detroit, Hungry Horse, and McNary.

As a result gross revenue of the Columbia River power system amounted to $45,317,693, the largest for any year since inception of the program. This was an increase of $6,142,484 or 15.68 percent over the $39,175,209 gross in fiscal year 1953, when low water conditions in the area decreased output at the generating plants. The reason for the decrease in net revenue is the higher construction costs of the new dams and generating facilities coming into service, and consequent increases in depreciation and interest expense. Operating expenses also increased due to the installation of major transmission facilities prior to full development of the generating projects.

Table I shows a statement of revenue and expenses of the system. The data are commercial cost accounts kept in accordance with the Federal Power Commission system of accounts prescribed for electric utilities and are condensed from the auditor's report.

TABLE I.—*Columbia River power system—condensed summary of revenues and expenses—operating projects only*

	Fiscal year 1953	Fiscal year 1954	Total to June 30, 1954
Operating revenues	$39, 175, 209	$45, 317, 693	$349, 746, 787
Expenses of operation, maintenance, etc	10, 856, 179	12, 804, 967	95, 424, 404
Provision for depreciation	9, 410, 048	11, 638, 135	66, 046, 627
Interest expense	8, 983, 109	12, 248, 197	84, 883, 400
Miscellaneous deductions, net	358, 281	(11, 316)	1, 617, 406
Total deductions	29, 607, 617	36, 679, 983	247, 971, 837
Surplus net revenues from operations	9, 567, 592	8, 637, 710	101, 774, 950

Summary of Revenue

Table II summarizes by customer categories the source of revenue by fiscal years to and including 1954. The aluminum industry accounted for 35.18 percent of the total revenue for fiscal year 1954 while other industries accounted for 11.96 percent, slightly over 47 percent of the total gross revenue for the year. Sales to publicly owned utilities were 32.84 percent of the total and privately owned utilities, 17.39 percent. Other operating revenue made up the balance of 2.63 percent. Increased sales occurred in all categories of those for fiscal year 1953 with aluminum, $2,400,000; other industries $700,000; publicly owned utilities $1,000,000, and privately owned utilities $1,640,000.

Repayment of Federal Investment

As of June 30, 1954, the gross Federal investment in the power portion of all of the generating projects in operation and in the related transmission system amounted to $1,240,790,232, as shown in table IV. This is the total of all funds appropriated and requisitioned for construction and operations, together with indirect items such as WPA expenditures and other funds transferred from other Federal agencies plus the interest charge at 2½ percent annually on the unrepaid balance. A summary of the interest accumulation is shown in table III.

TABLE II.—*Revenue by class of customers through fiscal year 1954*

Class of customer	1949 and prior	1950	1951	1952	1953	1954	Total to June 30, 1954	1954 percentage (dollar revenue)
Industry:								
Aluminum	$75, 416, 310	$12, 133, 254	$13, 523, 276	$13, 376, 207	$13, 545, 562	$15, 944, 356	$143, 938, 965	35. 18
Other [1]	18, 437, 764	2, 677, 580	3, 774, 705	4, 650, 425	4, 715, 747	5, 417, 177	39, 673, 398	11. 96
Publicly owned utilities	20, 612, 420	8, 409, 428	9, 947, 909	12, 973, 025	13, 882, 890	14, 882, 997	80, 708, 669	32. 84
Privately owned utilities	38, 630, 918	7, 587, 963	8, 525, 609	8, 526, 775	6, 239, 276	7, 882, 879	77, 393, 420	17. 39
Other operating revenue	4, 589, 783	389, 291	417, 529	653, 714	791, 734	1, 190, 284	8, 032, 335	2. 63
Total operating revenue	157, 687, 195	31, 197, 516	36, 189, 028	40, 180, 146	39, 175, 209	45, 317, 693	349, 746, 787	100. 00

[1] Includes sales to Federal agencies.

TABLE III.—*Columbia River power system—Summary of interest on Federal investment as of June 30, 1954*

Interest during construction, to be returned during repayment period as part of the Federal investment:		
Transmission system	$4, 697, 557	
Bonneville Dam project	2, 332, 775	
Columbia Basin project	9, 727, 004	
Hungry Horse project	4, 708, 542	
McNary Dam project	14, 751, 905	
Albeni Falls project	700, 068	
Detroit and Big Cliff	2, 542, 532	
Subtotal		$39, 460, 383
Interest on costs at projects allocated to future river regulation, to be returned as part of repayment of future downstream projects:		
Columbia Basin project	12, 934, 026	
Hungry Horse project	433, 144	
Albeni Falls project	124, 616	
Subtotal		13, 491, 786
Interest charged to operations:		
Transmission system	31, 097, 858	
Bonneville Dam project	18, 065, 858	
Columbia Basin project	31, 976, 741	
Hungry Horse project	2, 351, 923	
McNary Dam project	615, 480	
Albeni Falls project	154, 496	
Detroit and Big Cliff	621, 046	
Subtotal		84, 883, 402
Gross interest accumulation		137, 835, 571

All receipts from power sales and miscellaneous sources allocable to power, except for small amounts transferred to the continuing fund, are deposited in the Treasury to repay the Federal investment. The continuing fund established by the Bonneville Act is maintained to meet emergencies and insure continuing operation.

The gross Federal investment has been periodically reduced and, as of June 30, 1954, the unpaid balance was $900,224,643 to be repaid out of revenue from future operations. Total repayment to date includes $170,155,673, representing the payment of all expenses incurred since inception of the program and $170,409,916 repaid on the capital investment of $1,070,634,559, as shown in table IV.

Inasmuch as no increase in the basic $17.50 kilowatt year rate will be made for at least 2 years from December 1954, additional generation scheduled for future years, while increasing gross revenue will reflect lower net revenue due to higher construction costs together with added interest and depreciation expenses for the newer projects.

A rate adjustment may be made, if necessary, and after approval by the Federal Power Commission, to become effective on December 20 of the year 1956 or 1957 or 1958.

TABLE IV.—*Columbia River power system—summary of Federal investment in operating power projects and repayment as of June 30, 1954*

	Gross investment	Repayments	Net investment
Investment in current expenses:			
Operation, maintenance, etc	$85, 272, 271	$85, 272, 271	
Interest [1]	84, 883, 402	84, 883, 402	
Total current expenses	170, 155, 673	170, 155, 673	
Investment in capital assets:			
Electric plant, inventories, etc.[2]	1, 013, 006, 646	170, 409, 916	$842, 596, 730
Unexpended appropriations	57, 627, 913		57, 627, 913
Total capital investment	1, 070, 634, 559	170, 409, 916	900, 224, 643
Total Federal investment	1, 240, 790, 232	340, 565, 589	900, 224, 643

[1] The Columbia River power system does not receive appropriations for payment of interest, but imputes and includes in its accounts provisions for interest expense and returns receipts to the Treasury in repayment of such expenses.

[2] Includes interest during construction of $39, 460, 383 which will be repaid to the Treasury as part of the capiital cost of electric plant, and $13,491,786 of interest charged to future downstream regulation recoverable from operations of future downstream hydroelectric plants.

A summary of plant accounts as of June 30, 1954, is shown in table V.

TABLE V.—*Columbia River power system—summary of plant accounts in operating projects as of June 30, 1954*

Project	Total	Allocation	
		Nonpower	Power
Bonneville Power Administration	$335, 171, 962		$335, 171, 962
Bonneville Dam project	86, 947, 927	$27, 329, 300	59, 618, 627
Columbia Basin project	481, 932, 267	274, 422, 597	207, 509, 670
Hungry Horse project	106, 933, 312	20, 810, 894	86, 122, 418
Albeni Falls project	27, 611, 778	258, 722	27, 353, 056
McNary Dam project	261, 344, 511	24, 942, 819	236, 401, 692
Detroit and Big Cliff project	65, 750, 950	27, 250, 314	38, 500, 536
Total plant	1, 365, 692, 707	375, 014, 646	990, 678, 061
Less: Combined reserve for depreciation			63, 777, 062
Total less reserve			926, 900, 999

Based on individual projects the return of power capital investment has been as follows:

Project	Power capital investment	Repaid as of June 30, 1954	Percent repaid	Net power investment
Bonneville Power Administration	$347, 767, 945	$90, 064, 194	25. 90	$257, 703, 751
Bonneville Dam project	59, 813, 926	21, 790, 983	36. 43	38, 022, 943
Columbia Basin project	221, 462, 229	51, 031, 697	23. 04	170, 430, 532
Hungry Horse project	87, 184, 051	2, 855, 592	3. 28	84, 328, 459
Albeni Falls project	26, 941, 232	302, 979	1. 13	26, 638, 253
McNary Dam project	231, 322, 397	3, 535, 258	1. 53	227, 787, 139
Detroit-Big Cliff project	38, 514, 866	829, 213	2. 15	37, 685, 653
Total	1, 013, 006, 646	170, 409, 916	16. 82	842, 596, 730

Foregoing data on repayment of the investment are based on cost accounts maintained in accordance with the Federal Power Commission uniform system of accounts. On a statutory repayment basis, the repayment percentages are the same as in the above table for the Bonneville Power Administration and Bonneville Dam, but different for the Columbia Basin project, since in the case of the latter (1) power revenues must pay operation and maintenance costs of Grand Coulee Dam and powerplant allocated to irrigation, (2) interest expense is computed at 3 percent rather than 2½ percent, and (3) other differences such as the exclusion of interest during construction in the payout accounts of the Columbia Basin project.

SUMMARY OF OPERATIONS

Energy Production

Energy generated at 6 Federal plants for the Administration totaled 20.2 billion kilowatt-hours during fiscal year 1954. This was an increase of 15 percent over fiscal year 1953 and an increase of 8.6 percent over fiscal year 1952. The marked increase over 1953 was caused by reduced stream flow in the Columbia River Basin in the first half of the year and resulted from addition of 9 units of generation at Big Cliff-Detroit, Hungry Horse, and McNary in fiscal year 1954 and the comparatively low stream flows in the Columbia River Basin the previous year.

New System Peak

A new system peak was reached for the hour 5–6 p. m. on January 20, 1954, before the generator at Big Cliff and the fourth generator at McNary were in operation. Coincident demand on Bonneville, Detroit, Grand Coulee, Hungry Horse, and McNary plants was 3,301,000 kilowatts, an increase of 15 percent over the previous fiscal year's maximum demand of 2,867,000 kilowatts occurring during August 1952.

Since the fall of 1946 maximum system demands have continuously exceeded the nameplate rating of installed generators. Energy produced at Federal plants for the Administration is shown by years in table VI with peak demand and energy data in the accompanying chart. Prepared on a quarterly basis the chart on page 94 shows the general trends of the Bonneville Power Administration system-load growth and development.

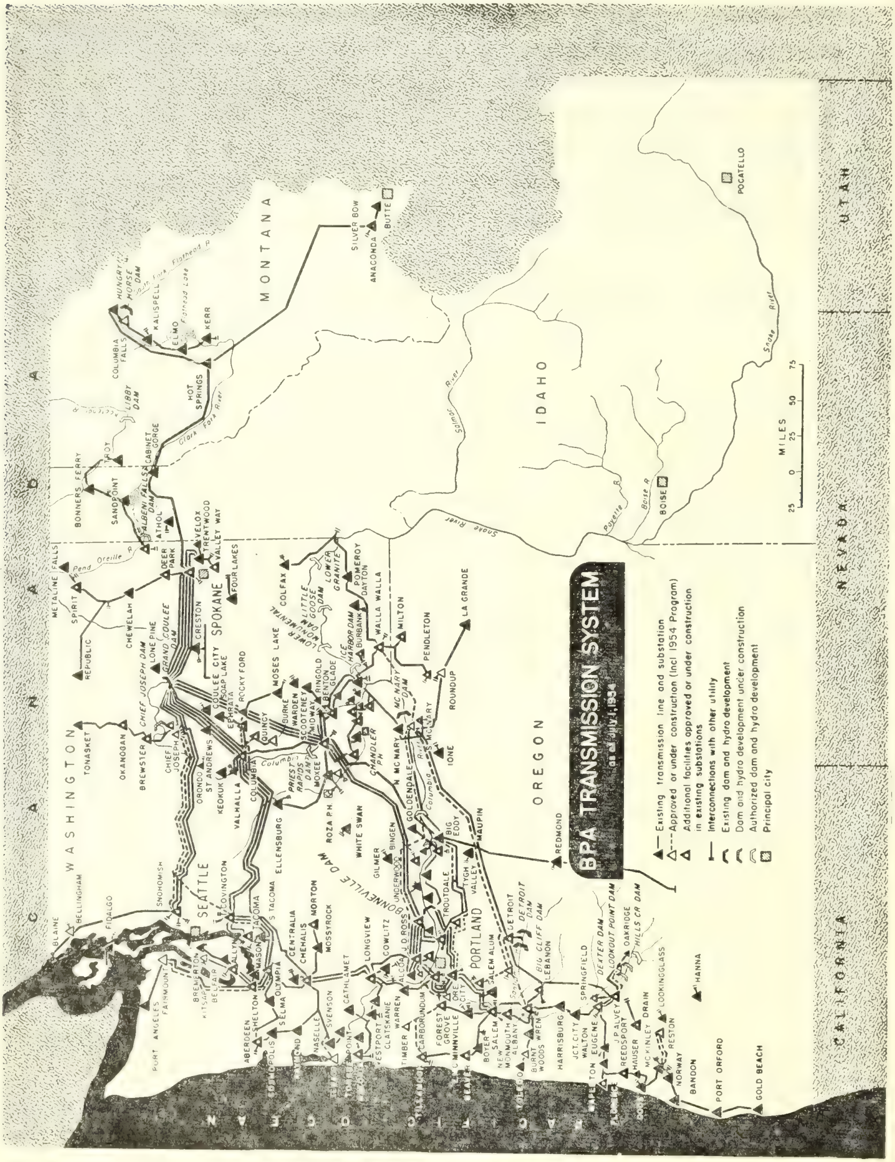

BPA TRANSMISSION SYSTEM
as of July 1, 1954
Existing transmission line and substation
Approved or under construction (Incl 1954 Program)
Additional facilities approved or under construction in existing substations
Interconnections with other utility
Existing dam and hydro development
Dam and hydro development under construction
Authorized dam and hydro development
Principal city
MILES
25 0 25 50 75
CANADA
WASHINGTON
OREGON
IDAHO
MONTANA
CALIFORNIA
NEVADA
UTAH
PACIFIC OCEAN
SEATTLE
SPOKANE
PORTLAND
BOISE
POCATELLO
BUTTE
ANACONDA
SILVER BOW
KALISPELL
HUNGRY HORSE DAM
COLUMBIA FALLS
ELMO
KERR
HOT SPRINGS
LIBBY DAM
CABINET GORGE
TROY
BONNERS FERRY
SANDPOINT
ALBENI FALLS DAM
ATHOL
VELOX
TRENTWOOD
VALLEY WAY
DEER PARK
FOUR LAKES
METALINE FALLS
SPIRIT
CHEWELAH
REPUBLIC
TONASKET
OKANOGAN
BREWSTER
CHIEF JOSEPH DAM
CHIEF JOSEPH
GRAND COULEE DAM
LONE PINE
CRESTON
COULEE CITY
SOAP LAKE
EPHRATA
ROCKY FORD
MOSES LAKE
COLFAX
LOWER GRANITE
LITTLE GOOSE DAM
LOWER MONUMENTAL DAM
POMEROY
DAYTON
WALLA WALLA
MILTON
PENDLETON
LA GRANDE
ROUNDUP
ICE HARBOR DAM
BURBANK
RINGOLD
BENTON
GLADE
BURKE
WARDEN
SCOOTENEY
MIDWAY
QUINCY
ORONDO
ST ANDREWS
KEOKUK
VALHALLA
COLUMBIA
PRIEST RAPIDS DAM
MOXEE
CHANDLER PH
MC NARY DAM
N MC NARY
MC NARY
IONE
ELLENSBURG
ROZA P.H.
WHITE SWAN
GOLDENDALE
BIG EDDY
MAUPIN
REDMOND
SNOHOMISH
COVINGTON
S TACOMA
TACOMA
BELLINGHAM
BLAINE
FIDALGO
PORT ANGELES
FAIRMOUNT
BREMERTON
KITSAP
BELFAIR
SHELTON
MASON
OLYMPIA
ABERDEEN
COSMOPOLIS
SELMA
CENTRALIA
CHEHALIS
MORTON
MOSSYROCK
BONNEVILLE DAM
GILMER
BINGEN
UNDERWOOD
NASELLE
SVENSON
CATHLAMET
LONGVIEW
COWLITZ
WESTPORT
CLATSKANIE
J.D. ROSS
ALCOA
TIMBER
WARREN
CARBORUNDUM
FOREST GROVE
ORE CITY
TROUTDALE
TYGH VALLEY
DETROIT DAM
BIG CLIFF DAM
SALEM ALUM
SALEM
MINNVILLE
BOYER
NEW MONMOUTH
ALBANY
LEBANON
BURNT WOODS
WREN
HARRISBURG
SPRINGFIELD
JCT CITY
WALTON
EUGENE
J P ALVEY
DEXTER DAM
LOOKOUT POINT DAM
OAKRIDGE
HILLS CR DAM
REEDSPORT
HAUSER
MC KINLEY
DRAIN
RESTON
LOOKINGGLASS
HANNA
NORWAY
BANDON
PORT ORFORD
GOLD BEACH
Columbia River
Snake River
Salmon River
Payette R
Boise R
Clark Fork River
Pend Oreille R
Flathead Lake
South Fork Flathead R

TABLE VI.—*Generation at Federal plants for Bonneville Power Administration, fiscal years 1939–54*

[Thousands of kilowatt-hours]

Fiscal years ending June 30—	Big Cliff generation	Bonneville generation	Detroit generation	Grand Coulee generation	Hungry Horse generation	McNary generation	Total generation for Bonneville Power Administration
1939		34, 874					34, 874
1940		208, 426					208, 426
1941		894, 177		7, 455			901, 632
1942		1, 807, 309		741, 844			2, 549, 153
1943		2, 801, 480		2, 816, 956			5, 618, 436
1944		3, 488, 874		5, 750, 949			9, 239, 823
1945		3, 391, 127		5, 660, 446			9, 051, 573
1946		2, 674, 834		3, 561, 329			6, 236, 163
1947		3, 695, 255		5, 058, 482			8, 753, 737
1948		3, 991, 860		[1] 6, 894, 047			10, 885, 907
1949		3, 868, 558		[1] 9, 057, 230			12, 925, 788
1950		3, 689, 309		[1] 10,451, 524			14, 140, 833
1951		3, 793, 276		[1] 12,679, 108			16, 472, 384
1952		4, 462, 935		[1] 14,092, 466			18, 555, 401
1953		4, 227, 463	[2] 2, 149	[1] 13,277, 143	[3] 126, 477		17, 633, 232
1954	8, 324	4, 406, 265	[3] 416, 372	[1] 13,885, 832	682, 134	796, 906	20, 195, 833
Total	8, 324	47, 436, 022	418, 521	103, 934, 811	808, 611	796, 906	153, 403, 195

[1] Includes energy transferred for Bureau of Reclamation.

[2] Includes energy for testing operations.

[3] Does not include 7,466,000 kilowatt-hours for condensers at Detroit.

TABLE VII.—*Electric energy account, fiscal year ended June 30, 1954*

Energy received (thousands of kilowatt hours):	
Energy generated for Bonneville Power Administration:	
Big Cliff	8, 324
Bonneville	4, 406, 265
Detroit	[1] 416, 372
Grand Coulee	[2] 13, 885, 832
Hungry Horse	682, 134
McNary	796, 906
Total	20, 195, 833
Power purchased and interchanged in	2, 739, 695
Total received	22, 935, 528
Energy delivered (thousands of kilowatt-hours):	
Sales	18, 764, 627
Power interchanged out	2, 640, 274
Used by Administration	25, 231
Total delivered	21, 430, 132
Energy losses in transmission and transformation	1, 505, 396
Losses as percent of total energy received ____ percent	6. 6
Maximum demand on generating plants (kilowatts), January 20, 1954, 5–6 p. m., Pacific standard time	3, 301, 000
Load factor, total generated for Bonneville Power Administration ____ percent	69. 8

[1] Does not include 7,466,000 kw.-hr. for condensers at Detroit.

[2] Includes 57,292,833 kw.-hr. transferred over BPA transmission facilities for Bureau of Reclamation.

Receipts and Deliveries

Bonneville Power Administration's transmission grid forms the backbone of the interconnected transmission system of public and private utilities in the Pacific Northwest. As a result electric energy receipts and deliveries on Bonneville's transmission system cover many complex transactions in addition to receipts from Federal powerplants and deliveries by sales.

The integrated transmission grid makes possible the fullest utilization of power facilities in the area through diversity in peaking and water capabilities and diversity of system-load conditions. Substantial quantities of energy are received and delivered as transfers from other utilities.

Transactions also involve storage by the Administration in non-Federal reservoirs as well as storage by non-Federal utilities in the Grand Coulee Reservoir. Disposition of energy includes deliveries from storage in Grand Coulee or to storage in other reservoirs, energy transfers for the Bureau of Reclamation from Grand Coulee, energy used by the Administration and energy losses in transmission and transformation.

Table VII, electric energy account, summarizes energy receipts and deliveries for fiscal year 1954.

Sales of 18.8 Billion Kilowatt-Hours

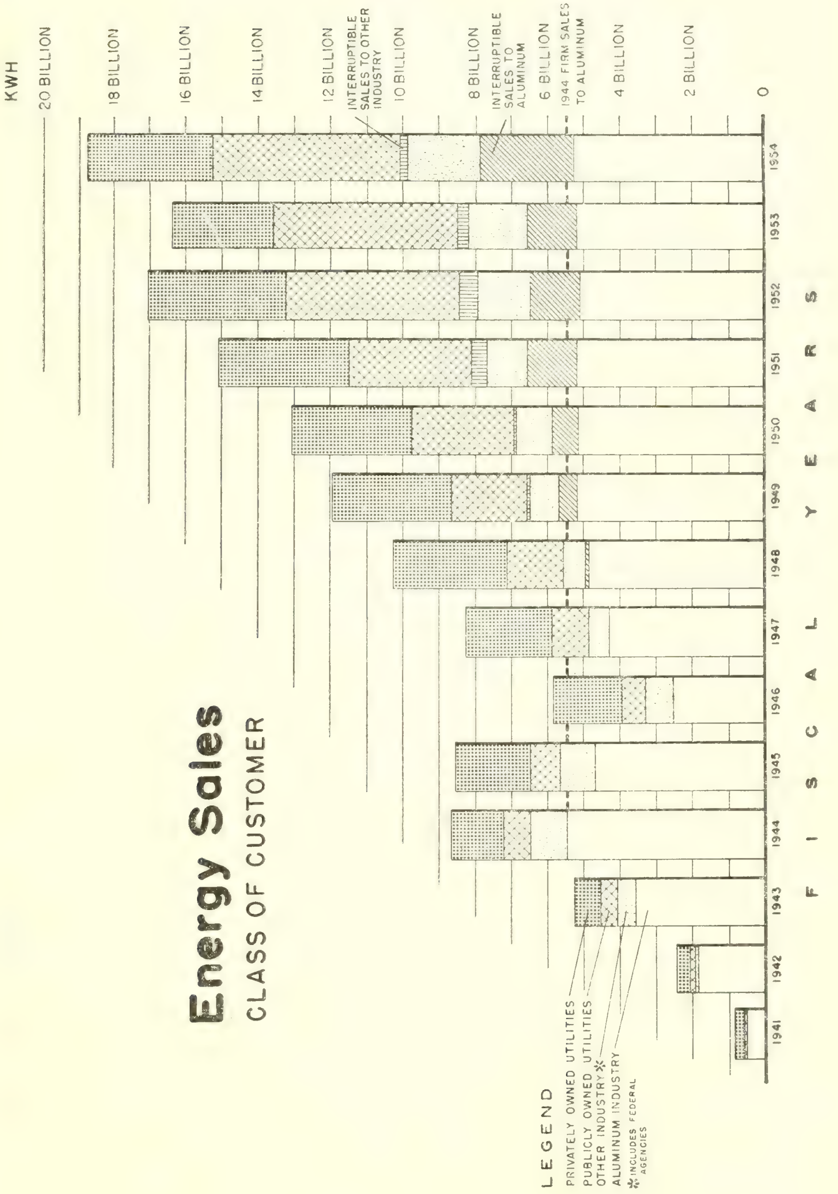
Energy sales to customers of the Bonneville Power Administration totaled 18.8 billion kilowatt-hours during fiscal year 1954, an increase of 14.5 percent over the previous year.

Sales of electric energy to other utilities, both publicly and privately owned, totaled 8.1 billion kilowatt-hours, an increase of 9.5 percent over the previous fiscal year. Deliveries to industrial plants and Federal agencies totaled 10.1 billion kilowatt-hours, an increase of 19.1 percent.

With better than minimum water flow in the Columbia during the first 6 months of the year and favorable water conditions during the last 6 months it was possible to deliver almost 3 billion kilowatt-hours of interruptible energy to industrial customers. This was an increase of 6.6 percent over the 1953 fiscal year when unfavorable water conditions cut off interruptible deliveries during 4 months of the year.

Composite Average Rate of 2.40 Mills

The Administration has delivered 142,617,635,000 kilowatt-hours of energy at a composite average rate of 2.40 mills per kilowatt-hour during the 16 years of operation ending June 30, 1954. Sales to pub-



Energy Sales
CLASS OF CUSTOMER

licly owned utilities for this period were 28.8 billion kilowatt-hours at an average of 2.81 mills. Privately owned utilities received 32.8 billion kilowatt-hours at an average rate of 2.34 mills, and industries 80.9 billion kilowatt-hours at an average rate of 2.27 mills.

Power sales to aluminum plants were 66.7 billion kilowatt-hours at an average rate of 2.17 mills. Sales to industries other than aluminum including sales to Federal agencies were 14.2 billion kilowatt-hours at an average of 2.76 mills.

Sales by class of customer are shown in table VIII.

TABLE VIII.—*Electric energy sales by class of customer—fiscal years 1939–54*

[Thousands of kilowatt-hours]

Fiscal years ending June 30	Aluminum	Other industries[1]	Publicly owned utilities	Privately owned utilities	Total
1941 and prior	522, 982	4, 829	35, 242	536, 555	1, 099, 608
1942	1, 845, 249	79, 155	142, 491	357, 704	2, 424, 599
1943	3, 588, 848	507, 196	435, 289	739, 076	5, 270, 409
1944	5, 453, 893	1, 022, 477	727, 642	1, 467, 304	8, 671, 316
1945	4, 667, 381	964, 724	823, 822	2, 057, 203	8, 513, 130
1946	2, 492, 985	799, 378	635, 531	1, 902, 990	5, 830, 884
1947	4, 212, 413	626, 688	1, 044, 784	2, 377, 887	8, 261, 772
1948	4, 902, 465	646, 913	1, 560, 754	3, 180, 993	10, 291, 125
1949	5, 665, 746	881, 454	2, 080, 833	3, 343, 091	11, 971, 124
1950	5, 863, 465	1, 023, 830	2, 839, 913	3, 311, 972	13, 039, 180
1951	6, 544, 702	1, 537, 580	3, 414, 245	3, 578, 212	15, 074, 739
1952	6, 471, 694	1, 943, 241	4, 803, 210	3, 793, 699	17, 011, 844
1953	6, 546, 677	1, 947, 129	5, 110, 297	2, 789, 175	16, 393, 278
1954	7, 862, 085	2, 253, 331	5, 127, 298	3, 521, 913	18, 764, 627
Total to July 1, 1954	66, 640, 585	14, 237, 925	28, 781, 351	32, 957, 774	142, 617, 635

[1] Includes Federal agencies.

TABLE IX.—*Electric energy sales by rate schedules—fiscal year ending June 30, 1954*

Rate schedule	Energy (thousands of kilowatt-hours)	Revenue	Mills per kilowatt-hour
C–3, C–4:			
Industries	9, 846, 648	$20, 570, 066	2. 09
Utilities	4, 660, 869	10, 426, 739	2. 24
Subtotal	14, 507, 517	30, 996. 805	2. 14
F–2, F–3, F–4:			
Industries	18, 171	111, 262	6. 12
Utilities	61, 470	281, 881	4. 59
Subtotal	79, 641	393, 143	4. 94
A–4: Utilities	16, 893	55, 558	3. 29
E–3, E–4: Utilities[1]	3, 201, 969	10, 150, 067	3. 17
Experimental, H–2, H–3 and exchange: Industries and utilities	958, 607	2, 396, 517	2. 50
Total sales	18, 764, 627	43, 992, 090	2. 34
Reconciliation with accounting records		+135, 319	
Other electric revenues		1, 089, 244	
Total operating revenues		45, 216, 653	

[1] Including Federal agency pumping service.

Rate Schedules

More than three-fourths of the energy sales for the year were made under the C–4 wholesale rate schedule at an average rate of 2.14 mills per kilowatt-hour. This is the kilowatt-year rate for firm power delivered anywhere from the transmission system and is also used with special measured demand provisions for sales of interruptible power. Sales are generally made under this rate to industries operating at high load factor and to utilities having substantial generating facilities. Other sales were made principally under the E schedule to utilities purchasing all or substantially all of their power requirements from the Administration. Sales under the F schedule were made to the utilities and industries requiring power at low-load factor use and under the H schedule for dump, exchange, or experimental purposes. A summary of energy sales for the fiscal year 1950 classified by rate schedules is shown in table IX.

Customers Served

The Administration was serving 114 customers at the end of fiscal year 1954. There were 78 publicly owned distributors of power, 17 industrial customers, 12 Federal agencies and 7 privately owned utilities. There were three customer changes during the year: Hanna Nickel Smelting Co. was added, the United States Engineer Corps discontinued service at McNary, and Mountain States Power Co. merged with Pacific Power & Light Co.

Generation Added

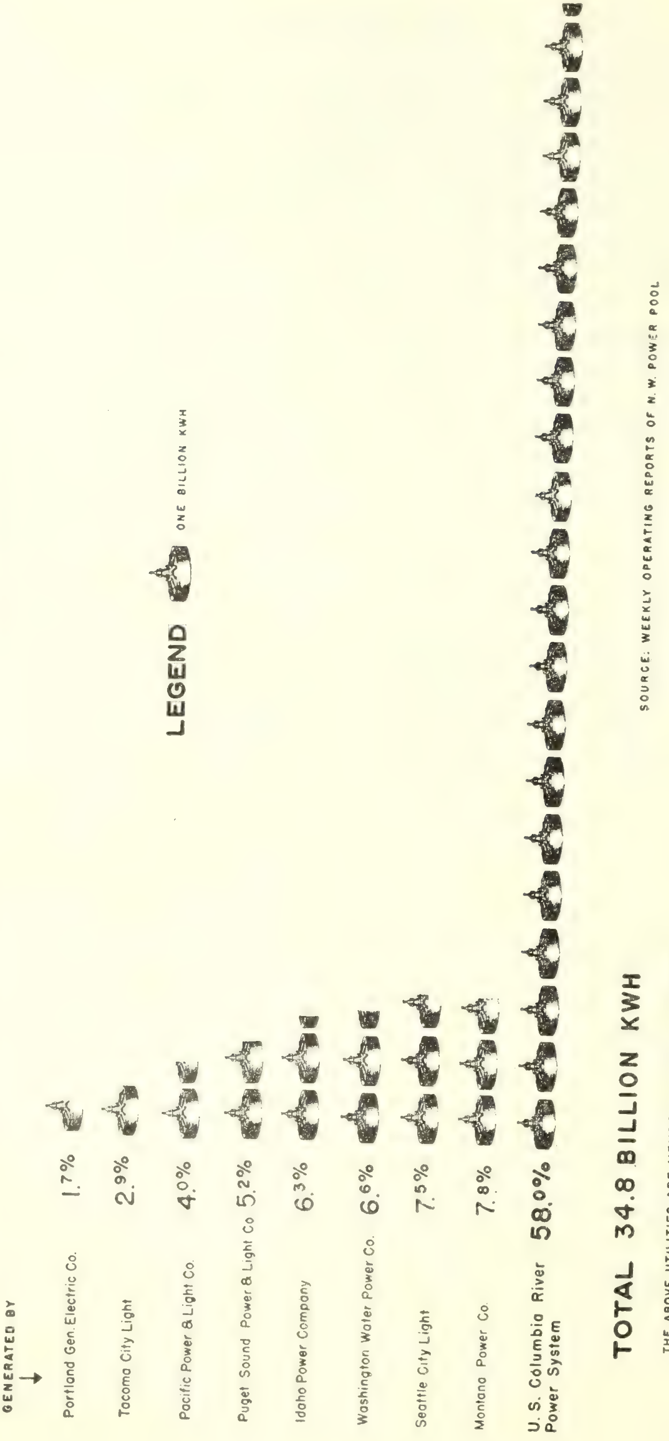
Additions to the Federal system in fiscal year 1954 have a nameplate rating of 540,500 kilowatts. Hungry Horse project units 3 and 4 with a combined rating of 142,500 kilowatts were brought into operation by the Bureau of Reclamation. The Corps of Engineers completed Detroit Dam on the North Santiam River in Oregon with initial operation of two generators having a total nameplate rating of 100,000 kilowatts. The Big Cliff reregulating dam downstream with an 18,000-kilowatt generator was also completed, permitting peaking operations to start at Detroit in November 1953. The first four generators, with combined rating of 280,000 kilowatts, were placed in service by the Corps of Engineers at McNary Dam.

Projects Summarized

Federal projects existing, under construction, and authorized for construction by the Corps of Engineers and the Bureau of Reclamation are shown in table X. With all these projects operating as a sys-

Power Generated BY THE PRINCIPAL ELECTRIC UTILITIES OF THE PACIFIC NORTHWEST

YEAR ENDED JUNE 30, 1954



SOURCE: WEEKLY OPERATING REPORTS OF N. W. POWER POOL

TOTAL 34.8 BILLION KWH

THE ABOVE UTILITIES ARE MEMBERS OF THE NORTHWEST POWER POOL. UTAH POWER & LIGHT CO. AND BRITISH COLUMBIA ELECTRIC CO. ARE ALSO POOL MEMBERS BUT ARE NOT INCLUDED IN THIS CHART BECAUSE THEIR MAJOR SERVICE AREAS LIE OUTSIDE THE PACIFIC NORTHWEST REGION.

tem, existing generating capacity, excluding the 10 McNary units not yet in operation, would provide 2,637,000 average kilowatts of nominal prime power. Generating capacity under construction including the 10 McNary units would provide an additional 1,815,000 kilowatts, and authorized projects would add 2,259,000 kilowatts.

Existing storage capacity including Albeni Falls Reservoir is 9,532,000 acre-feet. An additional 336,000 acre-feet will be provided by Lookout Point Reservoir now under construction and 5,805,000 acre-feet by currently authorized projects.

All contemplated generation and storage capacity for the projects under construction will be in service by November 1961 under present schedules. Service dates for the authorized projects are not scheduled as no funds are appropriated for their construction. Upon completion, all these multipurpose projects would provide a total of 15.7 million acre-feet of usable storage and 6.7 million kilowatts of prime power.

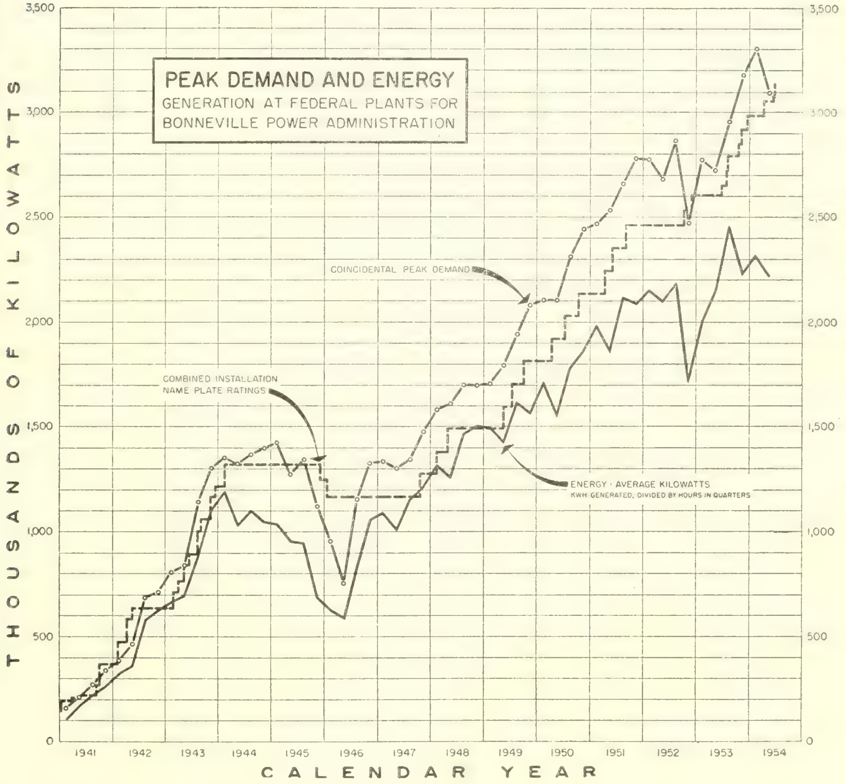


TABLE X.—*General specifications—Existing and authorized projects. Installations and capabilities correspond to a coordinated system of operation*

	Location	Stream	Plant installations		Nominal prime power kilowatts [2]	Pool elevation (feet)	Usable storage (acre-feet)	Average head (feet)	Initial date in service	Principal purpose [3]
			Number of units	Total capacity kilowatts [1]						
Existing projects:										
Bonneville	Washington-Oregon	Columbia	10	518, 400	458, 000	72. 0		59	June 1938	P, N.
Grand Coulee	Washington	do	18	1, 944, 000	1, 631, 000	1, 288. 0	5, 072, 000	326	September 1941	P, I, FC, N.
Hungry Horse	Montana	South Fork Flathead	4	285, 000	187, 000	3, 560. 0	2, 982, 000	364	October 1952	P, I, FC, N.
Detroit	Oregon	North Santiam	2	100, 000	29, 000	1, 569. 0	323, 000	290	July 1953	P, I, FC, N.
McNary	Washington-Oregon	Columbia	14	980, 000	583, 000	340. 0		83	November 1953	P, I, N.
Big Cliff	Oregon	North Santiam	1	18, 000	10, 000	1, 206. 0		91	June 1954	P.
Total				3, 845, 400	2, 898, 000		8, 377, 000			
Projects under construction:										
Lookout Point	Oregon	Middle Fork Willamette	3	114, 000	36, 000	929. 0	336, 000	228	December 1954	P, I, FC, N.
Albeni Falls	Idaho	Pend Oreille	3	42, 600	29, 000	2, 062. 5	1, 155, 000	24	January 1955	P. FC. N.
Dexter	Oregon	Middle Fork Willamette	1	15, 000	12, 000	695. 0		53	April 1955	P.
Chandler	Washington	Yakima	2	12, 000	11, 000	620. 0		118	September 1955	P, I.
Chief Joseph	do	Columbia	16	1, 024, 000	815, 000	946. 0		169	do	P, I.
The Dalles	Washington-Oregon	do	16	1, 119, 000	651, 000	160. 0		87	November 1957	P, N.
Total				2, 326, 600	1, 554, 000		1, 491, 000			
Authorized projects:										
Libby	Montana	Kootenai	6	600, 000	264, 000	2, 459. 0	5, 010, 000	267		P, FC, N.
Ice Harbor	Washington	Snake	3	195, 000	137, 000	440. 0		97		P, I, N.
Lower Monumental	do	do	3	180, 000	130, 000	533. 0		92		P, I, N.
Little Goose	do	do	3	195, 000	139, 000	633. 0		99		P, N.
Lower Granite	do	do	3	165, 000	114, 000	715. 0		80		P, N.
Priest Rapids [4]	do	Columbia	18	954, 000	735, 000	550. 0	(5)	146		P, FC, N.
John Day [4]	Washington-Oregon	do	13	1, 105, 000	675, 000	255. 0	(5)	94		P, I, FC, N.
Roza	Washington	Yakima	2	11, 250	6, 000	1, 220. 6		140		P, I.
Hills Creek	Oregon	Middle Fork Willamette	2	30, 000	14, 000	1, 543. 0	291, 000	220		P, I, FC, N.
Cougar [4 6]	do	South Fork McKenzie	1	25, 000	14, 000	1, 683. 0	182, 000	418		P, I, FC, N.
Green Peter [4 6]	do	Middle Santiam	2	81, 000	22, 000	984. 0	322, 000	315		P, I, FC, N.
White Bridge [4 7]	do	do	1	15, 000	9, 000	670. 0		93		P.
Total				3, 556, 250	2, 259, 000 −[8] 28, 000		5, 805, 000			
Total (24 projects)				9, 728, 250	6, 683, 000		15, 673, 000			

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[1] Nameplate rating.

[2] Average capability during an 8-month storage release period (September 1936 through April 1937).

[3] P-Power; I-Irrigation; FC-Flood control; N-Navigation.

[4] Legislation is under consideration providing for non-Federal financing of these projects.

[5] Authorization provides for flood control storage of 2,100,000 acre-feet at Priest Rapids and 2,000,000 acre-feet at John Day.

[6] Power facilities are not authorized.

[7] White Bridge is not authorized but is required for reregulating purposes with installation of generating units at Green Peter.

[8] Pumping requirements of 28,000 average kilowatts for 450,000 acres of the Columbia Basin project.

Non-Federal Additions

Additions to generating facilities of non-Federal utilities in the area served by the administration for fiscal year 1954, have a nameplate rating of 249,200 kilowatts. A 90,000-kilowatt unit was installed at the Ross plant of the city of Seattle, and the final 50,000-kilowatt unit was installed at the Cabinet Gorge plant of Washington Water Power Co. Reconstruction of the Portland General Electric Co.'s Sullivan plant was completed with installation of the last 1,200-kilowatt unit. Yale project with rating of 108,000 kilowatts was completed on the Lewis River by Pacific Power & Light Co. Future additions presently scheduled by non-Federal utilities in this area are shown in table XI.

TABLE XI.—*Non-Federal utilities—generator installation schedule, July 20, 1954*

Utility and plant	Stream	Unit No.	Nameplate rating (thousands of kilowatts)	Date in service
Pend Oreille County public utility district: Box Canyon.	Pend Oreille	2 3 4	15 15 15	August 1954. October 1954. November 1954.
Portland General Electric Co.:				
Oak Grove (Frog Lake forebay)	Clackamas		(1)	August 1954.
Timothy Meadows Reservoir (60,000 acre-feet of usable storage).	do		(2)	October 1955.
Montana Power Co.: Kerr	Flathead	3	56	November 1954.
City of Tacoma: Steam plant No. 2		2	25	December 1954.
City of Centralia: Yelm	Nisqually	3	5	December 1954.
City of Seattle:				
Ross	Skagit	4	90	July 1957.
Gorge	do	(3)	(3)	July 1957.

(1) Will add 18,000 kilowatts of peaking capacity.
(2) Will add 10,000 kilowatts of prime power at downstream plants.
(3) Increased height of dam. Will increase gross head by 88 feet and peaking capability by 47,000 kilowatts.

Northwest Power Pool

Generation during fiscal year 1954 by the principal electric utility systems of the Pacific Northwest is shown in table XII. All of the utilities are members of the Northwest Power Pool. The Utah Power & Light Co. and the British Columbia Electric Co. are also members of the pool but are not included as their major service areas are outside the Pacific Northwest region.

Northwest Power Pool NET OPERATIONS YEAR ENDING JUNE 30, 1954

BPA SUPPLIED 85% OF NET ENERGY REQUIREMENTS OF POWER POOL UTILITIES

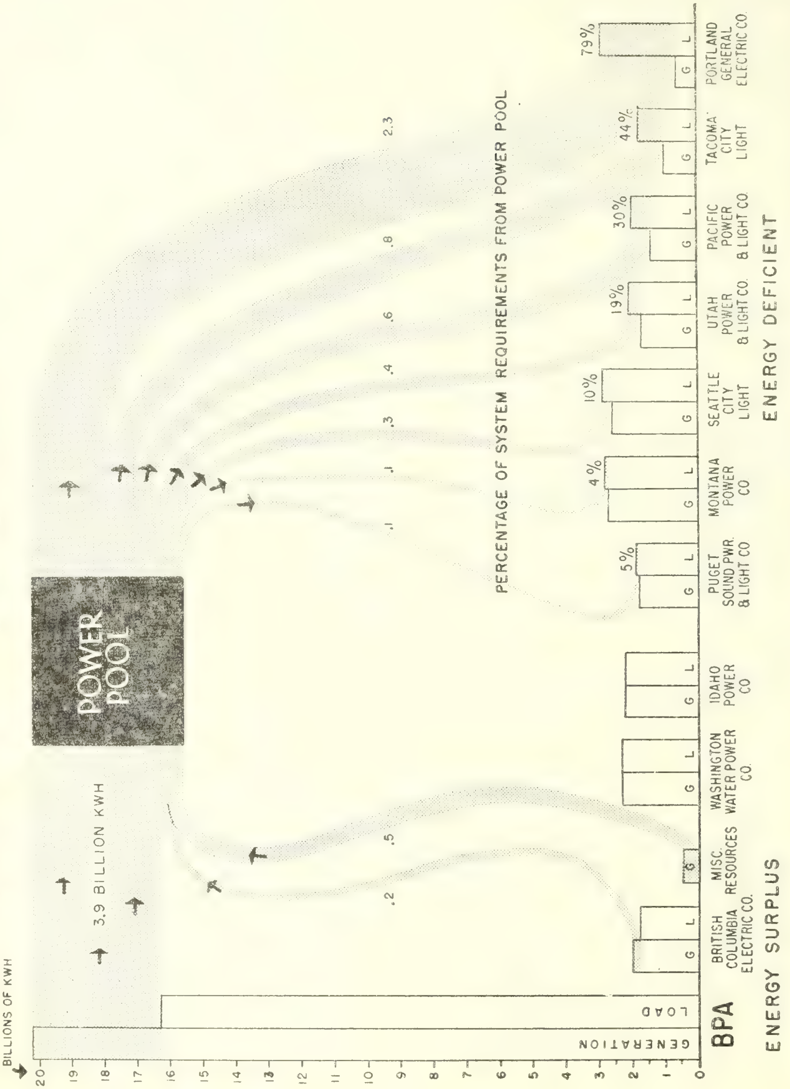
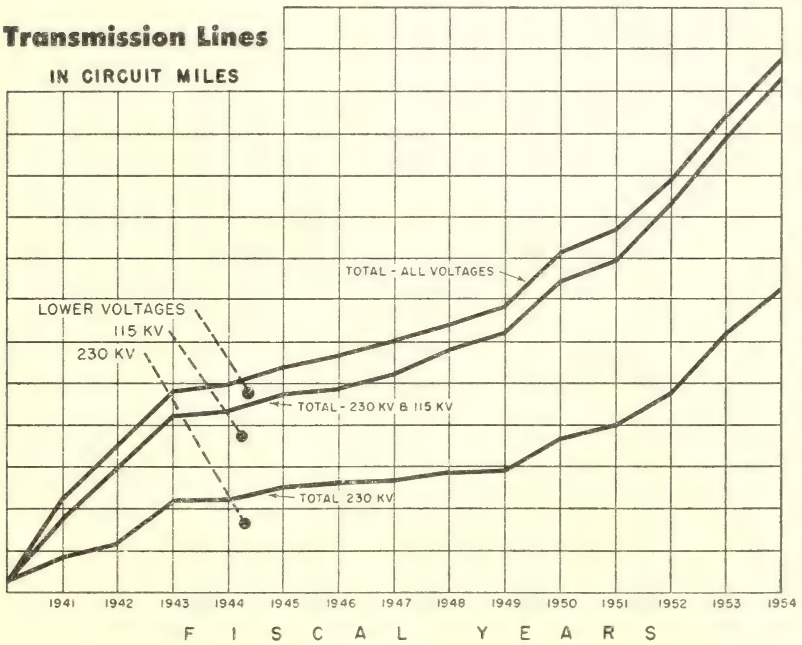


TABLE XII.—*Generation by the principal electric utility systems of the Pacific Northwest, fiscal year 1954*

Utilities	Kilowatt-hours	Percent o total generation
Publicly owned:	*Billions*	*Percent*
Bonneville Power Administration	20.2	58.0
Seattle City Light	2.6	7.5
Tacoma City Light	1.0	2.9
Total publicly owned	23.8	68.4
Privately owned:		
Puget Sound Power & Light Co	1.8	5.2
Washington Water Power Co	2.3	6.6
Pacific Power & Light Co	1.4	4.0
Portland General Electric Co	.6	1.7
Montana Power Co	2.7	7.8
Idaho Power Co	2.2	6.3
Total privately owned	11.0	31.6
Total generation [1]	34.8	100.0

[1] The above utilities are members of the Northwest power pool. Utah Power & Light Co. and British Columbia Electric Co. are also members of the pool, but are not included above because their major service areas lie outside the Pacific Northwest region.

The Administration supplied 58 percent of the total energy generated by the major utilities of the region. In addition to the power requirements of industries and nonpool utilities served by the Administration approximately 3.9 billion kilowatt-hours of energy was provided for use by other pool utilities to meet their requirements.



Transmission System Additions

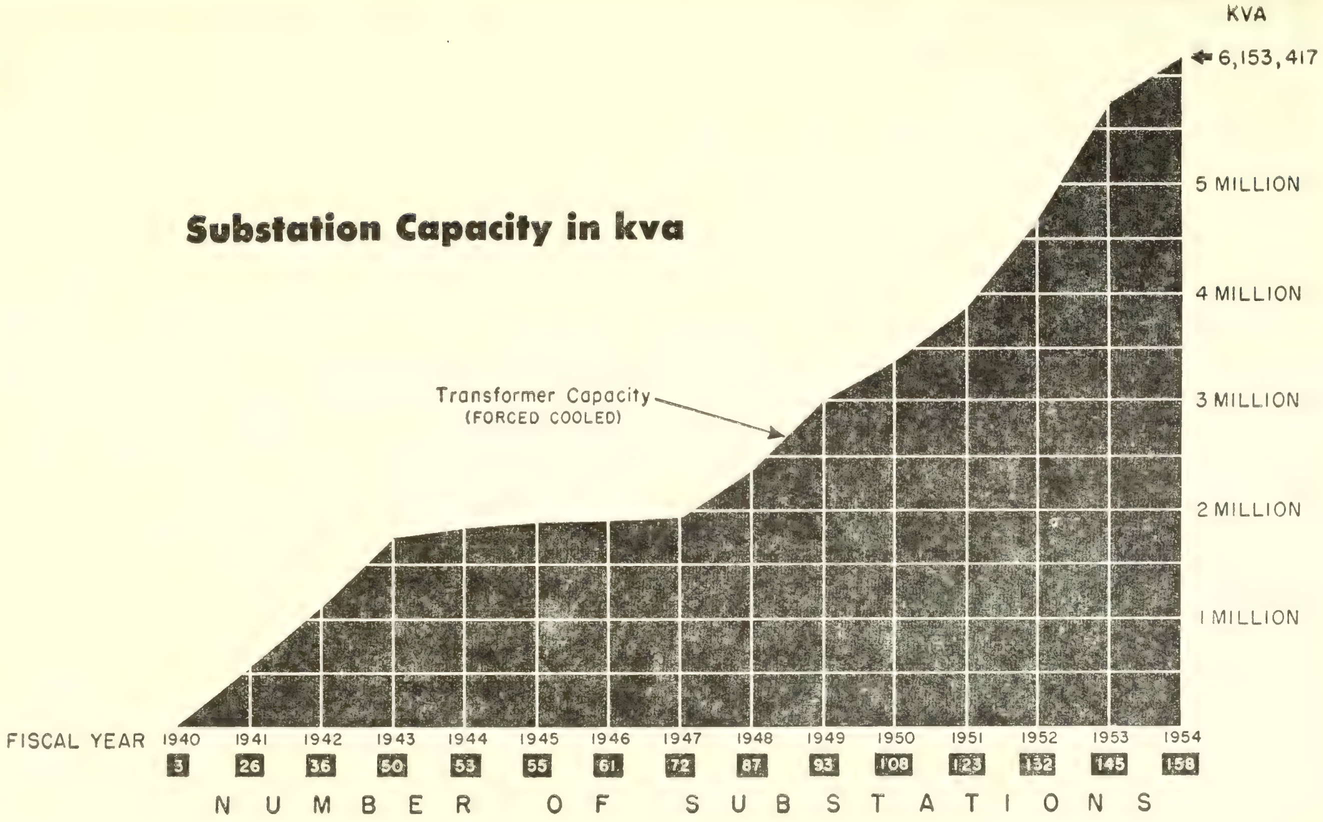
A new 96-mile, 230,000 volt transmission line from McNary Dam to the Big Eddy, Oreg., substation was energized in November 1953, providing the transmission facility necessary to integrate the initial power production from McNary Dam with the Bonneville Power Administration system. In December 1953 an additional 77-mile, 230,000 volt line, from Big Eddy to the Troutdale, Oreg., substation was energized, carrying McNary power to the Portland load center. To transmit the power from additional generating units placed in service at McNary Dam the 104-mile, McNary-Maupin 230,000 volt line was energized in June 1954. This line connected to the previously existing circuit from Maupin to the Alvey substation brings McNary generation to the Willamette Valley load center.

Energization of the 155-mile, Columbia-Olympia transmission line at 230,000 volts provided additional transmission capacity to the Puget Sound area. This line is connected to an existing Grand Coulee-Columbia line, providing a through circuit from Grand Coulee to Olympia. Installation was started during the year of terminal facilities at Grand Coulee and Olympia to raise the operating voltage of this line to 287,000 volts.

Twelve new customer service substations, ranging in capacity from 3,000 to 150,000 kilovolt-amperes, were energized during this fiscal year. Transformer capacity was increased at the G. H. Bell, Longview, Walla Walla, Redmond, and Grandview substations with the addition of forced cooling equipment to existing transformers.

During fiscal year 1954 a total of 670 circuit miles of transmission lines were added to the system, giving the Administration a total of 6,377 circuit miles of transmission lines. This total includes 3,627 circuit miles of 230,000 volt line, 2,517 circuit miles of 115,000 volt line, and 233 miles of lower voltage line.

A total of 13 substations were added to the system during this fiscal year, and the substation transformer capacity was increased by 444,333 kilovolt-amperes. With these additions the Administration's system includes 158 substations with 4,609,750 kilovolt-amperes of transformer capacity under self cooled conditions, and a maximum of 6,153,417 kilovolt-amperes with forced cooling. Static capacitors, with a capacity of 132,350 reactive kilovolt-amperes were installed, bringing the total on the system to 991,865 reactive kilovolt-amperes.



Substation Capacity in kva

New Construction

Major construction activity during the fiscal year was concentrated on the facilities for bringing power from Chief Joseph Dam to the Puget Sound area, and on additional transmission lines from McNary Dam to the Portland and Willamette Valley load centers. To bring initial power from Lookout Point Dam into the Bonneville system in the fall of 1954, a 115,000 volt transmission line from Lookout Point Dam to the J. P. Alvey substation was constructed. Installation of microwave communication facilities from Portland to Spokane and from Portland to the J. P. Alvey substation were under way during the year, with completion of the facilities scheduled for the fall of 1954. Construction was started in May 1954 on the new power dispatching center in the Portland Department of Interior Building.

Southwestern Power Administration

Douglas G. Wright, *Administrator*

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FOR the fiscal year 1954 Southwestern Power Administration received $1,600,000 in appropriations for carrying on its operation and maintenance program. Also, previously appropriated funds for construction in the amount of $2,420,000 remained available for the completion of the Administration's construction program. Expenditures not to exceed $1,200,000 were authorized from the continuing fund for the purchase of electric power and energy, and rentals for the use of transmission facilities.

POWER RESOURCES

The installed generating capacity in powerplants at these projects as of June 30, is shown in the following table:

Existing power installations

Project	River basin	Installed capacity
		Kilowatts
Denison	Red	70,000
Norfork	White	70,000
Narrows	Ouachita (Red)	17,000
Bull Shoals	White	160,000
Fort Gibson	Grand (Neosho)	45,000
Tenkiller Ferry	Illinois	34,000
Whitney	Brazos	30,000
Total		426,000

This capacity of 426,000 kilowatts will be augmented by 75,000 kilowatts when Blakely Mountain project on the Ouachita River comes into production, approximately January 1, 1955, thus increasing installed capacity to 501,000 kilowatts.

ENERGY PRODUCTION

Adverse water conditions prevailed throughout the fiscal year in the SPA area as the most severe period of low stream flow ever experienced continues. Denison Reservoir is the only hydro project showing near normal inflow for the year and this was only made possible by the high inflows of May 1954. As shown in the following table, four of the five reservoirs of the interconnected system have experienced extremely low inflow this year. At the end of the fiscal year, these four reservoirs were entering their 27th consecutive month of low flow with the total volume of flow less than two-thirds the flow of any former period of comparable length.

Project:	*Percent of normal*
Bull Shoals	17
Norfork	38
Tenkiller Ferry	36
Fort Gibson	17
Denison	98
Narrows	56
Whitney	58

During the first half of the fiscal year the Denison Reservoir water level was very low. Energy was carried over SPA's interconnecting transmission system from Bull Shoals and Norfork plants to assist Denison plant in carrying its normal load. The condition reversed itself the last half of the year as water became available at Denison. Denison plant in carrying its normal load. This condition reversed the load on Bull Shoals and Norfork. The interconnecting transmission system is enabling SPA to make maximum use of water available.

Net generation within the Southwestern Power Administration area during the 1954 fiscal year was 780,612,340 kilowatt-hours. Of this, 742,679,900 kilowatt-hours was on the interconnected system. The net generation from each project is given below:

Project:	*Kilowatt-hours*
Bull Shoals	334, 661, 000
Norfork	132, 752, 800
Tenkiller Ferry [1]	43, 337, 900
Fort Gibson	39, 497, 200
Denison	192, 431, 000
Subtotal (interconnected system)	742, 679, 000
Narrows	17, 774, 010
Whitney	20, 158, 430
Subtotal (isolated plants)	37, 932, 440
Total	780, 612, 340

[1] Commenced commercial operation in November 1953.

ENERGY DELIVERIES

Southwestern Power Administration delivered power and energy to preferred customers directly over its lines and through the facilities of the Texas Power & Light Co., the Southwestern Gas & Electric Co., the Public Service Co. of Oklahoma, the Oklahoma Gas & Electric Co., the Central Electric Power Cooperative, the Western Farmers Electric Cooperative, the M & A Electric Power Cooperative, and the N. W. Electric Power Cooperative.

During the year, electric service was initiated to six new preferred customers. These include 3 military installations in Oklahoma with a total contract demand of 4,800 kilowatts, 2 municipalities in Missouri with a total contract demand of 4,000 kilowatts, and 1 federated cooperative in Missouri to which the Government has a maximum contractual obligation of 20,000 kilowatts. Also, eight additional delivery points were provided for existing preferred customers. In addition, service began to the Arkansas Power & Light Co. under a triparty agreement whereby 150,000 kilowatt capacity supplied by SPA supplements the Arkansas Power & Light Co. in its service to the Reynolds Metals Co., a defense industry in Arkansas.

Contracts with 18 rural electric cooperatives were amended to increase contract demands by a total of 6,100 kilowatts. Contracts with 8 municipalities were amended to increase contract demands by a total of 10,540 kilowatts, and contracts with 2 military installations were amended to increase contract demands by a total of 800 kilowatts.

At the end of fiscal year 1954, the sum of obligations to and contract demands of all preferred customers served by SPA amounted to 187,360 kilowatts, comprised of the following:

	Kilowatts
Rural electric distribution cooperatives (contract demands)	29,970
Federated cooperatives (maximum contract obligations)	119,350
Military installations (contract demands)	9,900
Municipalities (contract demands)	28,140

During the fiscal year 457,646,699 kilowatt-hours of electric energy were sold to preferred customers; equivalent to 62.5 percent of the total of 732,774,813 kilowatt-hours hydroelectric energy marketed by this Administration. In addition, purchases of thermal electric energy for integration with hydroelectric energy, and energy received through interchange, amounted to 89,371,229 kilowatt-hours; therefore, the total energy marketed was 822,146,042 kilowatt-hours, of which 55.7 percent was sold to preferred customers.

Revenue from sales by this administration during the fiscal year amounted to $4,711,999. This amount included sales to preferred customers of $2,450,490, and sales to private utility companies of $2,261,510.

By the end of the fiscal year, wholesale power and energy generated by the hydroelectric facilities under the marketing jurisdiction of SPA were being sold to 16 distribution cooperatives, 19 municipalities, 5 private utilities, 5 United States military installations, and 6 federated cooperatives.

CONTRACT NEGOTIATIONS

A contract is being negotiated with the Brazos Electric Power Cooperative under which it is proposed that the cooperative will receive the entire output of the Whitney Dam project, an isolated project on the Brazos River in Texas.

A contract is being negotiated with the Arkansas Power & Light Co. under which it is proposed that the company will make power and energy available to the Government from the system of the company in return for the entire output of the Blakely Mountain Dam project, an isolated project in Arkansas.

The agreements this administration had with certain wholesale power cooperatives for leasing their transmission facilities, and for the purchase and sale of electric power and energy were made inactive by the action of Congress on Southwestern Power Administration's request for appropriations for the 1954 fiscal year. As a result, long-term contracts are now being negotiated for the sale of hydroelectric power and energy to wholesale power cooperatives in Missouri, which contracts involve the integration of the systems of the cooperatives with certain Missouri power companies.

PERSONNEL

Personnel activities have been controlled by the progression of the organizational study initiated by the Department in November 1953 and resulting in the authorization and direction to schedule and effect the organization recommended by the survey team. Except for routine functioning and essential personnel programs, specific actions have been limited to three phases of work:

1. Planning and carrying out a reduction in force program which reduced employment in the Administration by 28 percent;
2. Making studies to determine the essential tasks required to perform the functions established for the new organization and assignment of these tasks to positions; and
3. Analysis, evaluation and classification of new positions.

Total employment in the Administration at the close of the 1954 fiscal year was 154 full-time employees. Of these employees, 108 are serving under permanent or probational appointments, 40 under indefinite appointments, 1 under temporary limited appointment, and 5 under excepted appointments. Sixty-nine employees have veteran's preference, including 66 men and 3 women. Thirty-five employees are under the benefits of the Social Security Act and 119 have retirement act benefits.

SUPPLY AND PROCUREMENT

Contract administration and procurement were confined mostly to completion of construction contracts in progress, minor substation installations, and various specialized items of transformers, communications and protective equipment along with routine operational and service needs. Major supply activities consisted of the determination of supply requirements of the Administration operating under the plan of the reorganization and disposition of excess and surplus property. During the year stores and equipment were reduced by 35 percent.

ARKANSAS-WHITE-RED BASINS INTERAGENCY COMMITTEE

Representatives of the Southwestern Power Administration participated during the year with officials of other departments, bureaus, agencies, and States in plans and studies for the development of the land and water resources of the Arkansas, White, and Red River Basins.

Representatives of SPA participated in the activities of the various subcommittees and work groups; directed the activities of the transmission line subgroup of the hydroelectric power work group; and represented the Department on the water use and control task groups responsible for preparing overall tentative basin plans for navigation, flood control, hydroelectric power, irrigation, drainage, and domestic and industrial water supply. Through its representation on the southwest field committee, this Administration is participating in the formulation of definite plans and methods for future resource development to activate the recommendations of the final report.

OPERATION AND MAINTENANCE

No change in the mileage of transmission lines operated and maintained by SPA occurred in fiscal year 1954. Present mileage is: 558.7 of 161-kilovolts, 256.1 of 138-kilovolts, and 188.6 of 69-kilovolts, or a total of 1003.4 miles of high voltage transmission lines.

Of the five substations and switching stations reported under construction and scheduled for completion in 1954, Springfield and Carthage, Mo., are completed and in service. Clinton, Mo., is substantially completed but not energized, and installation of system communications for these stations is nearing completion. Anadarko and Tupelo, Okla., are being operated but some equipment is yet to be received and installed.

Establishment of a system operations center at Springfield, Mo., and employment of system operators (dispatchers) were started in May, fiscal year of 1953, and full operation around the clock was started May 12, 1954.

Operation and maintenance of cooperatives' facilities by SPA were discontinued in July 1953, in accordance with congressional action on appropriations. SPA, the cooperatives, and the companies have been actively negotiating integration and long term contracts. In the meantime, interim contracts between SPA and the cooperatives are being used.

LITIGATION

In *Kansas City Power & Light Company et al.* v. *McKay* (substituted) *et al.* (115 F. Supp. 402), the District Court of the District of Columbia upheld the validity of numerous complicated contracts between Southwestern Power Administration and various rural electric cooperatives in Missouri. The plaintiffs have appealed from the final judgment entered in the case. At the close of the fiscal year their appeal was pending before the Court of Appeals, District of Columbia Circuit.

In *United States* v. *Arkansas Power & Light Company.* This was an action by the Government against the power company to recover damages for alleged breach of contract. The contract pertained to the sale and delivery to the power company of electrical energy generated by the Government's Norfork Dam project in Arkansas. The district court entered judgment of dismissal, upon the merits, and the Government appealed. The Court of Appeals (8 Circ.) affirmed the judgment of dismissal (207 F. 2d 943).

In *Central Electric Power Cooperative* v. *McKay et al.* (D. C. unreported), a suit for declaratory judgment, the District Court for the District of Columbia rendered judgment for the plaintiff. The Interior Department Appropriation Act, 1954, provided for the use of a continuing fund in making purchases of electric power and energy and in making payments of rentals for use of transmission facilities. The court held that the fund is available to carry out a power purchase contract and a transmission line rental contract which the plaintiff had with the Government. At the close of the fiscal year, the cause was pending on the defendant's notice of appeal to the Court of Appeals, District of Columbia Circuit.

Southeastern Power Administration

Charles W. Leavy, *Administrator*

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THE Congress appropriated a total of $1,268,000 for the agency to carry out all activities during the fiscal year. The appropriation in the regular Department appropriation bill for the year was divided into a $261,000 allowance for agency operation and maintenance, a $50,000 allowance for advance planning, and a $819,000 allowance for the purchase of firming energy and payment of wheeling fees. Because this latter allowance was based on the expectation of favorable water conditions which did not materialize at the John H. Kerr project, it was necessary to seek supplemental funds for the purchase of firming energy. Accordingly, $138,000 was appropriated by the Congress for this purpose in the third supplemental appropriation bill for 1954.

Fifty persons were employed by the agency at the beginning of the year. The year was concluded with a total working force of 45 employees assigned to all activities.

REORGANIZATION

A new organizational structure, consistent with the size of staff and scope of functions existing in fiscal year 1954 and projected for the ensuing year, was recommended to the Department and authorized by the Secretary in February 1954. Realinement of functions and transfers of personnel to carry out the approved reorganization were completed in March. While this reorganization reduced the organizational structure from 16 to 5 elements, a logical separation of functions is permitted and simplicity and flexibility in the use of personnel is so provided that maximum accomplishment of the agency's increasing workloads may be obtained with the reduced working force.

Physical disposition was made of surplus equipment to other bureaus within the Department, and approximately 25 percent of the office space previously occupied was vacated during the year.

POWER SALES ARRANGEMENTS

Power was disposed of under long-term or temporary marketing arrangements for each project in operation during the year as follows:

Cumberland Basin projects.—(Dale Hollow, Center Hill, Wolf Creek)—the entire output of these projects was sold to the Tennessee Valley Authority under a long-term contract negotiated by the Department in 1948. Agreement was reached with the Authority during the year on a temporary increase in the annual payment to reflect increased capacity installed at the Dale Hollow project. The Authority was notified of Southeastern's desire to review the contract rate provisions in order to determine whether a change in the applicable charges is necessary to attain the contract objectives of covering all fair and reasonable costs of producing power and energy at the projects.

Allatoona project.—The entire output of this project was sold to the Georgia Power Co. under a long-term contract negotiated by the Department in 1950.

John H. Kerr project.—Two-thirds of the output was disposed of under the wheeling and firming contract executed in 1952 with the Virginia Electric & Power Co. Power sales contracts were executed with 1 rural electric cooperative in Virginia and 5 cooperatives in North Carolina bringing to 17 the number of preferred purchasers served under the wheeling-firming contract. Contract demands for 11 cooperatives were increased during the year. Such new and revised contracts provide for the utilization of 60,000 kilowatts, the maximum amount of power available for sale to preferred purchasers under the wheeling-firming arrangement.

As the year ended, temporary disposal arrangements were being considered for the recently made available remaining one-third of the project's output.

Philpott project.—Operation began in September and temporary disposal was made of the entire output throughout the year to the Appalachian Electric Power Co. under a short-term, interim agreement pending the negotiation of long-term arrangements for this project.

Clark Hill project.—Power was sold to the South Carolina Public Service Authority under a long-term contract executed in 1953 and to the Greenwood County Electric Power Commission under a long-term contract renegotiated during the year. These long-term arrangements provide for the sale of 40,000 and 10,000 kilowatts, respectively. Terms and conditions to govern an additional long-term sale to the Authority were considered but final resolution deferred until long-term arrangements had been secured for power to be marketed in Georgia from the project.

The long-term disposition arrangements for power to be marketed in Georgia received secretarial consideration, but no final resolution had been reached as the year ended. Temporary disposal was made to the Georgia Power Co. under an existing short-term interim agreement which was extended monthly as required until terminated by the company during the last month in the year.

Further temporary disposition was made to the South Carolina Electric & Gas Co., which volunteered a desire to interconnect its system with the project for the purchase of secondary and dump energy. A short-term arrangement was negotiated to accomplish this purpose.

COST ALLOCATIONS AND RATES

Pursuant to departmental directives issued after agreement on the formulation of cost allocations had been reached among the Department, the Corps of Engineers, and the Federal Power Commission, the agency met with district and regional representatives of the corps and FPC to reconcile differences in results obtained from studies by the respective agencies relating to cost allocations for the John H. Kerr, Philpott, Allatoona, and Clark Hill projects. As the year ended, substantial agreement had been reached among the agencies as to the allocation of costs.

Development of preliminary repayment schedules, tax studies to determine loss in local tax revenue caused by construction of projects, and various economic analyses were made for the several projects preparatory to the filing of rate approval requests with the Federal Power Commission for long-term disposal arrangements.

Requests for approvals of interim rates contained in short-term contracts made during the year for temporary disposal of power from the Philpott and Clark Hill projects were submitted to the Federal Power Commission with subsequent approval and confirmation of the rates granted by FPC.

OPERATIONS AND PLANNING

Continuing study was performed on the hydrologic, economic, and engineering factors which affect power disposal arrangements. Systematic attention was given during the year to long-term tasks such as collection of data specifying the nature and extent of power loads, determination of firming energy requirements for specific contracts, assessment of operating characteristics of projects, and engineering and costs studies of alternative means for the transmission of power between projects and to purchasers.

Of particular importance was the study begun during the year of methods for coordinating the electrical operation of present and future projects. The benefits available from an integrated operation of the existing Clark Hill project and the Jim Woodruff project now under construction were determined after extensive study, and the electrical means required to secure such integrated operation were defined.

There was considerable rescheduling by the Corps of Engineers of intial operation dates of generating capacity. Two of the four new projects under construction in the area were rescheduled to reflect delays of 12 to 18 months. At the beginning of the year, 11 authorized projects were scheduled for initial operation before 1960, by the end of the year only 2 authorized projects were still scheduled for operation before 1960, the remainder having been rescheduled for indefinite dates after 1960 or deferred for further study.

CONSTRUCTION

As the year began there was in effect a preliminary injunction and there was pending in the Federal Courts a suit brought by two private utilities to enjoin permanently further construction by the agency of a 41-mile transmission line from the Clark Hill project to the Greenwood County Electric Power Commission. The Congress, in the Interior appropriation bill, 1954, authorized the disposition of the partially completed line to the Commission on terms that would reimburse the United States. Agreement was reached among the agency, the Commission, and the construction contractor on disposal arrangements. Subsequently, the companies agreed to a procedure for terminating the suit, the preliminary injunction was dissolved by the courts, the companies' petition was dismissed, and agreement was entered into with the Commission transferring all of the rights and interests which the Government had in the line.

POWER RESOURCES

Installed generating capacity

Project	Basin	Kilowatts installed capacity	
		Beginning of year	End of year
Dale Hollow	Cumberland	36, 600	54, 600
Center Hill	do	135, 000	135, 000
Wolf Creek	do	270, 000	270, 000
Allatoona	Coosa	74, 000	74, 000
Clark Hill	Savannah	120, 000	240, 000
John H. Kerr	Roanoke	108, 000	204, 000
Philpott	do		14, 000
Total		743, 600	991, 600

Capacity under construction

Project	Basin	Kilowatts ultimate capacity
Clark Hill	Savannah	40,000
Jim Woodruff	Apalachicola	30,000
Buford	do	86,000
Old Hickory	Cumberland	100,000
Cheatham	do	36,000
Total		292,000

Capacity authorized for construction

Project	Basin	Kilowatts ultimate capacity
Hartwell	Savannah	300,000
Fort Gaines	Apalachicola	130,000
Carthage	Cumberland	92,000
Celina	do	64,800
Three Islands	do	9,000
Stewarts Ferry	do	13,500
Millers Ferry	Alabama	57,000
Jones Bluff	do	51,000
Booneville	Kentucky	7,300
Jessamine Creek	do	13,900
Salem Church	Rappahannock	64,000
Gathright	James	34,000
Bluestone	Kanawha	180,000
Total		1,016,500

POWER SALES AND REVENUES

Power sold

Project	Capacity (kilowatt)	Energy (kilowatt-hours)			
		Firm and Secondary	Dump	Condenser operation	Total
Clark Hill	115,000	422,742,000	105,500,750	0	528,242,750
John H. Kerr	162,700	310,379,672	40,505,500	876,600	351,761,772
Philpott	12,000	12,426,100	1,815,700	0	14,241,800
Allatoona	87,300	109,396,000	5,851,000	7,147,000	122,394,000
Dale Hollow	54,000	65,227,000		5,246,000	70,473,000
Center Hill	135,000	292,094,000		14,137,000	306,231,000
Wolf Creek	270,000	413,500,000		32,158,000	445,658,000
Total	836,000	1,779,437,722		59,564,600	1,839,002,322

Purchasers

	Capacity (kilowatt)	Energy (kilowatt-hours)
Clark Hill:		
South Carolina Public Service Authority	59, 000	236, 365, 000
Greenwood County Electric Power Commission	10, 000	109, 099, 000
Georgia Power Co	46, 000	160, 090, 000
South Carolina Electric & Gas Co	----------	22, 688, 750
John H. Kerr:		
Mecklenburg Electric Cooperative	6, 958	27, 014, 150
Southside Electric Cooperative	8, 121	33, 044, 942
Northern Piedmont Electric Cooperative	2, 412	10, 244, 765
Shenandoah Valley Electric Cooperative	6, 624	30, 129, 595
Virginia Electric Cooperative	6, 810	30, 835, 200
Prince George Electric Cooperative	1, 143	4, 594, 950
B-A-R-C Electric Cooperative	2, 400	9, 118, 800
Craig-Botetourt Electric Cooperative	1, 143	4, 028, 470
Community Electric Cooperative	2, 719	10, 873, 260
Northern Neck Electric Cooperative	2, 071	9, 388, 240
Central Virginia Electric Cooperative	3, 966	16, 243, 857
Prince William Electric Cooperative	1, 603	6, 223, 020
Albermarle Electric Membership Corp	1, 409	4, 830, 960
Edgecombe-Martin County E. M. C	1, 725	7, 340, 813
Halifax Electric Membership Corp	1, 024	3, 608, 000
Roanoke Electric Membership Corp	3, 425	11, 675, 548
Woodstock Electric Membership Corp	983	3, 236, 918
Virginia Electric and Power Company	108, 164	129, 330, 284
Philpott: Appalachian Electric Power Co	12, 000	14, 241, 800
Allatoona: Georgia Power Co	87, 300	122, 394, 000
Dale Hollow, Center Hill, Wolf Creek: Tennessee Valley Authority	459, 000	822, 362, 000
Total	836, 000	1, 938, 022, 322

Revenues earned

Project	Revenue this fiscal year	Revenue last fiscal year	Total revenue to date
Clark Hill	$2, 619, 918. 89	$631, 177. 30	$3, 251, 096. 19
John H. Kerr	2, 697, 171. 58	1, 381, 234. 73	4, 078, 406. 31
Philpott	166, 504. 25	----------	166, 504. 25
Allatoona	924, 128. 50	954, 076. 50	4, 170, 231. 07
Dale Hollow Center Hill Wolf Creek	1, 523, 300. 00	1, 982, 100. 00	10, 286, 900. 00
Total	7, 931, 023. 22	4, 948, 588. 53	21, 953, 137. 82

Defense Electric Power Functions

Fred G. Aandahl, *Assistant Secretary*

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THE administration of certain functions with respect to electric power are vested in the Secretary of the Interior under the Defense Production Act of 1950, as amended (50 U. S. C. App. 2061), Executive Order 10480 of August 14, 1953 (18 F. R. 4939), Office of Defense Mobilization Order I–7, and Office of Defense Mobilization letter dated June 30, 1953, to the Assistant Secretary—Water and Power.

The DefenseElectric Power Administration was abolished effective June 30, 1953, by Department of Interior Order No. 2721 dated May 7, 1953. The defense functions in this field were delegated to the Assistant Secretary—Water and Power Development, by section 2 of Secretarial Order 2764, dated June 29, 1954. Programs are conducted in connection with general supervision of electric power expansion to assure an adequate power supply for the Nation, and allocation functions to assure delivery of materials needed by the electric power industry for the 89 E–5 rated units committed for interim, firm, and backup power supply to the AEC program.

Authority to use the E–5 program identification, replacing the H–3 rating, has been extended to 52 power projects associated with AEC power supply. Under the Defense Materials system allotment of materials as required have been made for this program. Due principally to severe slippages in some turbine deliveries in the past and in some isolated instances during the current year, the program has lagged. However, 50 units are now scheduled to be in operation by the end of 1954, 83 by the end of 1955, and the entire 89 by the end of June 1956.

Through June 30, 1954, applications for certificates of necessity for rapid tax amortization for 928 electric utility projects and 43 industrial powerplants were received. Of these 700 and 41 respectively were recommended for approval. Certificates of necessity recommended were related to an increase in the Nation's electric power capacity of 27,718,155 kilowatts from electric utility systems and 862,150 kilowatts from industrial power plants. On December 3, 1953, ODM by order VII–6 placed the electric power goal No. 55 on the suspended list. The Department of the Interior has recommended to the Office of Defense Mobilization that power goal No. 55 be closed provided, however, that all applications for necessity certificates received after the goal was placed on the suspended list December 3, 1953, and prior to the closing date, be processed if they are eligible under the terms of the present goal and transmission lines and/or substations for service to any defense project for which a tax amortization certificate has been issued under any open goal shall remain eligible for consideration or appropriate action for tax amortization assistance.

The electric power goal No. 55 called for the installation of 41 million kilowatts of new generating capability by the end of 1955, and 1 million kilowatts for certain defense related projects in 1956. Attainment of this goal would increase the national generating capability from 75 million kilowatts at the end of 1951 to 116 million kilowatts at the end of 1955. The capabalities added in 1952 and 1953 and the indicated additions for 1954 through 1955 are:

	Millions of kilowatts
1951 total at year end	75.0
Added during 1952	6.5
1952 total at year end	81.5
Added during 1953	9.5
1953 total at year end	91.0
Additions during 1954 (estimated)	12.5
1954 total at year end	103.5
Additions during 1955 (estimated)	12.5
1955 total at year end (estimated)	116.0

The capabilities presented above for the years 1954 and 1955 are based upon existing construction schedules and plans of the individual power systems for bringing new power projects into commercial operation. In previous reports, difficulty in maintaining construction schedules because of shortages of materials for equipment manufacture and plant erection have been emphasized. Such difficulties have now been largely removed making it possible to carry out further expansion without serious delays.

The Department of the Interior and the Federal Power Commission have examined the electric power situation for the 3 years 1955 through 1957, and in estimating the load requirements and capabilities it has been assumed that there will be a continuation of partial mobilization and a sustained high level of economic activity. The present peak load estimate for 1957 approaches 112 million kilowatts, however, utility planning indicates 130 million kilowatts of generating capacity will be in service by the end of 1957, which will provide prudent gross margins of capacity in most regions.

Saline Water Conversion Program

David S. Jenkins, *Director*

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IN JULY 1952, because of the constantly expanding need for new sources of fresh water, and the increasing salinity of many waters already being used, Congress authorized the Saline Water Conversion Program for an initial period of 5 years. The act (66 Stat. 328, 42 U. S. C., sec. 1951) provides for research into and development of practical means for the economical production, from sea or other saline water, or water suitable for agricultural, industrial, municipal, and other beneficial consumptive uses, and for other purposes, as necessary to conserve and increase the water resources of the Nation.

Although the original legislation would have provided for immediate construction and operation of a demonstration plant at $25 million, testimony by eminent engineers and scientists established clearly that processes for the economical production of large quantities of fresh water at low cost did not exist. Accordingly, the statute provides appropriately instead for the development of such processes. Furthermore, although good progress is being made, to date such processes have not been developed to the stage that would justify the expenditure of public funds for the construction and operation of such demonstration plants either in the United States or abroad.

The program is devoted equally to the improvement of the many inland saline surface and underground waters and to the conversion of sea water for useful purposes. The Department's responsibility is twofold: first to stimulate research and development in saline water utilization by exchange of information and coordination of private and public research in the field; and by encouraging such development through research grants and contracts.

The first year was devoted to organization of the research program. During the second year considerable research and development has been initiated by the Department through contracts with private scientific and industrial institutions. Most of the scientific and engineering leaders in the field are assisting either as research contractors or in the capacity of consultants. Nine eminent leaders of educational, scientific and industrial institutions serve as advisers to the Secretary of the Interior concerning the broad policy aspects of the program and its economic and social potentialities. In addition a Departmental Saline Water Conversion Program Committee consisting of one representative each from the Office of the Assistant Secretary for Water and Power Development, the Bureau of Reclamation, the Bureau of Mines, and the Geological Survey provides advice and assistance in such matters as technical evaluation of research, development and review of the program, exchange of information and coordination of activities in connection with the program, and preparation of the annual reports.

The research is continuously coordinated with the Department of Defense in accordance with the Saline Water Act of 1952 and with the National Science Foundation with which a cooperative agreement exists. Other governmental organizations with which cooperation has been established include the Atomic Energy Commission, the Smithsonian Institution, Federal Civil Defense Administration, the Department of Agriculture, Department of State, the Foreign Operations Administration, and Department of Commerce.

It is clear that no one process will meet all purposes. Instead several different processes are needed each providing optimum performance under different combinations of location and quality of the existing saline waters and the character and magnitude of the water requirements. Some of the considerations are: Salinity of the original water, i. e. sea water or brackish waters of many varieties; magnitude and types of industrial needs, extent and size of each separate municipal need; irrigation requirements in various soils, climates and quantities; individual farm supply requirements, including livestock water; the availability of other water supplies for total or partial blending with totally or partially treated water; the possibility of changing entire local uses; and use of dual systems.

For these reasons, and because the cost of existing treatment processes so far exceeded the maximum costs then considered practicable for the several uses, all processes and phenomena and energy sources which might conceivably be developed for the purpose were considered. Clearly impractical processes are being eliminated. Others are investigated and developed. Research and development contracts have been awarded to responsible organizations covering more than a third of the apparently potential processes or phenomena. These include vapor compression distillation, critical pressure devices, low temperature differences, solar evaporation, freezing, molecular oil films, immiscible liquids and various membranes.

Already one process for one major purpose—that of improving brackish water to render it useful for irrigation—shows encouraging results. Under contract with Ionics, Inc., of Cambridge, Mass., the Department has been investigating the process variables of an ion transfer membrane demineralizer. The process makes use of plastic membranes and electric current to remove the salt from salt water. The membranes are set up in a stack similar to a filter press with passages for the water between the membranes. The membranes are either positive or negative in character. A positive membrane is adjacent to a negative membrane in the stack. This makes possible the passage through the membranes of the positive salt ions in one direction and the negative salt ions in the other direction when electrical current is applied at the ends of the stack. By this action the water passing between alternate membrane pairs is depleted in salt, while that between the intervening pairs is enriched.

A 100-gallon-per-hour membrane demineralizer was assembled and subjected to rigid laboratory testing on brackish water. A new contract covers extensive field testing using larger apparatus on western brackish waters, thus exposing the unit to field conditions to determine its durability and other operating characteristics, and to obtain firmer estimates of the overall cost of treating water by the process on a large scale.

Under an exploratory contract with the Department, Polytechnic Institute of Brooklyn is to develop a different type of membrane demineralization which it is hoped will be capable of separating different minerals on a selective basis.

Good progress is being made on two other processes for desalting sea water. One is a version of vapor compression distillation where most of the heat used to evaporate the water is recovered through compression of the vapor and reused to evaporate additional water. The new process involves conditioning of the water mechanically to encourage rapid boiling by overcoming a possible obstructive skin on the surface of the water. The proposed means of accomplishing this would increase heat transfer coefficients severalfold over what has been considered practicable heretofore, thus reducing the cost of distilling water to a fraction of present costs. The Department's research and development work on this process is being conducted in conjunction with the Badger Manufacturing Co.

The other method is that being explored by the Department under a contract with Nuclear Development Associates of White Plains, N. Y. This process involves the possibility of using extremely high temperatures and pressures to obtain a phase separation of dissolved salts from sea water at the supercritical region of water.

Laboratory research on three other processes is successful so far and appears promising. The osmotic membrane process in which salt is literally forced from the water by high pressure is undergoing extensive research and experimentation under the Department's program at the University of Florida. Although the flow rate is very small one material has been found to remove 90 percent or more of the salt from sea water. The Department also has under study at the University of California a different type of membrane, namely, an extremely thin oil layer supported by capillary action. Application of such a principle involves the selective action of the osmotic oil membrane which allows water molecules to diffuse through it while other molecules are blocked. Still another method being considered by the Department is that incorporating the solvent extraction process being developed under contract with Texas A. & M. Research Foundation. This process makes use of organic solvents in which inorganic salts are quite insoluble but which will dissolve water readily. Since the solubility of water in many organic solvents decreases rapidly with temperature a portion of the salt-free water may be removed from the solvent phase by cooling it.

Research on solar distillation and separation by freezing is getting under way and offers good promise for specific uses. Studies on the use of solar energy for demineralization show a good possibility of competing favorably with present conventional vapor compression distillation and multiple-effect evaporation in some locations. Demineralization by freezing is being studied from the basic research standpoint in order better to understand the various phenomena occurring during crystallization.

Experience of the past year has shown that a few industrial firms are willing to undertake research on process development independently. Most of those firms are cooperating with the Department by exchanging information on their developments even though no contract exists. Their number is relatively small and for this reason it may become necessary to increase somewhat the participation by existing Government laboratories so as to assure development of needed processes.

After 2 years it seems apparent that during the initial 5-year period some of the several needs will be met or partially met and that the results obtained during that period will contribute to subsequent development of processes to serve additional needs; that economically feasible processes for improving some but not all brackish waters for some purposes will have been developed; that the cost of converting sea water will have been reduced materially making it usable for some industrial and municipal purposes; and that a substantial part of the uses may be met within 10 to 15 years. Thus it appears that it will be desirable to give early consideration to the extension of the authorization beyond the present initial 5-year period.

Office of the Assistant Secretary Mineral Resources

Felix Edgar Wormser, *Assistant Secretary*

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THE Assistant Secretary for Mineral Resources discharges the duties and performs the functions of the Secretary of the Interior in the field of the development and utilization of minerals and metals, including mineral fuels. These include as a primary responsibility the exercise of Secretarial direction and supervision over the Bureau of Mines, the Geological Survey, the Defense Minerals Exploration Administration, the Division of Oil and Gas. He also exercises similar supervision over the Division of Geography.

During the fiscal year 1954, the Secretary appointed two groups of highly qualified consultants from private life to survey the operations and practices of the Geological Survey and the Bureau of Mines. The recommendations of these two Survey Teams were carefully reviewed by the Assistant Secretary with appropriate bureau officials. Minor modifications were incorporated in certain instances, but most of the recommendations were scheduled for immediate or early implementation. Greatly improved management of the Department's activities within the minerals field should be the result.

The Office of the Assistant Secretary for Mineral Resources participated in the planning which preceded an orderly transfer of petroleum and gas mobilization functions from the Petroleum Administration for Defense to the Division of Oil and Gas. Defense functions with respect to solid fuels were placed on a standby basis within the Bureau of Mines.

In addition to his responsibilities within the Department the Assistant Secretary acts as Interior's principal spokesman and adviser on minerals affairs at policymaking levels within the Federal Government. He represents the Department on the Interdepartmental Materials Advisory Committee, the ODM Titanium Committee, and interagency committees on foreign economic policy. During the year the Assistant Secretary participated in the work of the Sub-Cabinet Committee for the Rio Economic Conference.

In addition, the Office of the Assistant Secretary for Mineral Resources coordinates the representation of the Department on the Advisory Committee (to the Secretary of Commerce) on Export Policy, in implementation of the Export Control Act of 1949. Petroleum and petroleum products, and several of the minerals and metals have been problem commodities requiring special export control attention.

The Office of the Assistant Secretary also provides the primary point of Government contact with mineral and metal producing industries. During the past year much personal effort has been devoted to establishment of closer working relationships with individuals and groups having an interest in mineral resources development.

An extremely significant development during the fiscal year 1954, was the establishment of a Cabinet Committee on Minerals Policy. By letter of October 26, 1953, the President asked the Secretary of the Interior to organize and to serve as chairman of a special committee to inquire into national policies affecting the production and utilization of metals and minerals. The Director of the Office of Defense Mobilization, the Secretary of State, and the Secretary of Commerce were designated as members, and the Secretary of the Treasury and the Director of the Bureau of the Budget were asked to serve as consultants. In each instance Cabinet members named alternates at the Assistant Secretary level. As the alternate member from the Department of the Interior, the Assistant Secretary for Mineral Resources organized and supervised staff work and met frequently with other alternates to prepare final position papers for consideration by the Cabinet group. Most of the groundwork had been completed prior to March 1954.

Certain basic proposals of the Committee on Minerals Policy were discussed with the President and the full Cabinet during the month of March. One recommendation made by the Committee called for expansion of the strategic stockpiling program as a means of strengthening the Nation's minerals mobilization base. This recommendation was endorsed by the President in an announcement made on March 26, 1954. The Cabinet Committee's work continued throughout the balance of fiscal year 1954, with the final report scheduled for delivery to the President early in fiscal year 1955.

In anticipation of a delegation of authority from the Office of Defense Mobilization, the Assistant Secretary initiated a series of mobilization studies within the minerals and metals field. An exhaustive analysis of the lead-zinc situation was completed within the fiscal year 1954 and a study on fluorspar was begun. The Assistant Secretary also developed tentative plans for organization of mobilization planning activities within the minerals area.

Geological Survey

W. E. Wrather, *Director*

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ON MARCH 3, 1954, the Geological Survey began its 75th year of work under the charter providing for "* * * classification of the public lands, and examination of the geologic structure, mineral resources, and products of the national domain." Through the work of 7,000 employees in the field and in laboratory and office, it investigates the mineral and water resources of the Nation, maps the topography and geology, and publishes the results of this work to aid in satisfying the complex demands of a constantly growing country. The scientific work of the Survey is accomplished through four divisions whose activities during the year are described in the statements that follow.

GEOLOGIC DIVISION

During fiscal year 1954, the Geologic Division continued its study of the geology of the United States and of the mineral resources of the Nation. Responsive to increasing concern over the future adequacy of these resources, the Division continued to emphasize the development of new and improved methods of exploration for mineral resources, supported by a broad program of basic research.

Photogeologic techniques were further refined and their application expanded; the acquisition of a trailer laboratory widened the usefulness of geochemical and geobotanical prospecting; the development of a shallow-reflection seismograph brings a new technique to the search for mineral deposits; a full year of operation of a second airplane for geophysical exploration has greatly expanded the scope of airborne magnetometer and radiometric investigations; and the application of modern statistical methods to problems of field geology (begun during the year) is expected to be of great help in mineral exploration.

Survey geologists continued their roles in the programs of the Defense Minerals Exploration Administration and the Emergency Procurement Service; in geologic investigations of mineral resources in

Latin American, Middle and Far Eastern countries for the Foreign Operations Administration; in a broad program of investigations of fissionable materials resources for the Atomic Energy Commission; in investigations of terrain conditions for the Armed Forces; and in serving as advisers and consultants to the National Science Foundation, the Office of Defense Mobilization, and the Department of Defense.

Mineral Deposits

Field work was conducted on 90 projects in 25 States; 9 of these projects were carried out in cooperation with State agencies. Exploratory drilling was continued on the Tintic, Utah, and Mojave Desert, California, projects, and on the Colorado Plateau. Regional mineral-resource studies were continued for the New England-New York Inter-Agency Committee and the Arkansas-White-Red Rivers Inter-Agency Committee. Survey geologists, in cooperation with engineers of the Bureau of Mines, continued to evaluate applications for loans to corporations and to supply technical advice needed for effective execution of contracts under the Defense Minerals Exploration Administration and the Emergency Procurement Service. Geological exploration and research on behalf of the Atomic Energy Commission were continued on the Colorado Plateau.

Notable accomplishments made during the year have produced valuable information on the Nation's mineral resources and have encouraged prospecting in several areas. A talc deposit was discovered in Vermont in an area not previously known to contain talc. In California suggestions made by Survey geologists while doing exploration work for the Defense Minerals Exploration Administration at the New Idria mine led to the discovery of mercury reserves totaling 4,000 flasks, equivalent to nearly 32 percent of the mercury produced in the United States in 1952. Field work near Sugar Pine Creek, Idaho, led to the discovery of a 15-foot-thick section of high-grade phosphate rock. In the Cuyuna Range, Minn., subdivision into mappable units of the stratigraphic section that includes two iron formations has greatly aided exploration in the area. A quick field test for approximate iron content was developed as a modification of the field test for titanium during field studies in the Cuyuna Range. A quick and accurate method of field analysis for niobium was developed in the laboratory of the Geochemical Prospecting Unit and the methods devised have been of great aid in the geological exploration of mineral deposits. Again this year, intensive geologic studies on the Colorado Plateau have resulted in finding new deposits of significant size and have extended known reserves of other deposits.

Petroleum and Natural Gas

In its effort to provide timely information of maximum usefulness for oil and gas exploration, the Survey did geologic mapping in areas on the frontier of oil exploration, such as the Pacific Northwest, studied the stratigraphy and lithology of deeper Paleozoic rocks in the midcontinent region, investigated the distribution and origin of oil-producing limestone reefs in Texas, and did research on the accumulation of oil and gas under hydrodynamic conditions. Efforts are made to insure that oil and gas investigations are undertaken where the need for exploration is greatest and in fields not thoroughly explored by commercial geologists, State surveys, and universities. During the year the Survey had 45 projects in 23 States that were primarily oil and gas studies.

An oil and gas laboratory was established in the spring of 1954 at Denver to conduct research on the origin, migration, and accumulation of oil and gas; to solve problems in petroleum geology and related fields of sedimentation, paleoecology, paleogeography, and paleotectonics; and to supplement the work of field projects.

Coal

The Geological Survey continued mapping of coal beds and intervening rocks in selected coal-bearing areas. Such detailed study of the extent, thickness, and correlation of coal beds and estimation of the reserves present in each bed provides the only route to full knowledge of the amount of coal available for present and future use. Eighteen such projects were carried on in 12 States, and reports were published giving the results of previous work in 3 areas in Indiana, 3 in Montana and North Dakota, 2 in Kentucky, and 2 in the Pennsylvania anthracite fields. One report on coal was placed on open file.

A progress report summarizing results of the Survey's program to reestimate the coal resources of the United States was published. Reappraisals of coal resources have now been made for about half of the States, and during the year new detailed estimates of the coal resources of Colorado and Indiana were published. Work leading to similar reports was carried on in Kentucky, Alabama, Arkansas, and Oklahoma.

During the spring of 1954 the Geological Survey and the Bureau of Mines agreed to readjust work on coal resources so that this responsibility, formerly shared by the two bureaus, will be entirely assigned to the Geological Survey by fiscal year 1956.

Oil Shale

The Survey continued to acquire knowledge of our reserves of oil shale. When the time comes to augment our petroleum supplies, it will be of great importance to know where the richest deposits are. With accelerated demands for petroleum, it is necessary for the country to appraise its secondary and emergency sources of oil.

A study and estimate of oil shale reserves in Naval Oil Shale Reserve No. 2, in eastern Utah, were made for the Navy. Similar studies were also extended to the east into Colorado and south to include the principal adjoining areas of oil shale outside the Naval Oil Shale Reserve. Oil shale studies were continued in New York throughout the year.

Engineering Geology

General service geologic mapping continued to provide valuable basic data for the industrial, agricultural, and social development of the country. Major emphasis is placed on the mapping of large urban or rural areas to provide maximum geologic information for use in the early planning and construction stages of various engineering projects. The work is all a part of the long-range program of mapping the geology of the United States.

Twenty-five field investigations in 10 States were in progress during the year. Detailed mapping was completed for three projects in the Missouri River basin and geologic mapping continued in Massachusetts and Rhode Island under cooperative agreements. Detailed engineering geologic investigations were continued in expanding urban areas, including the San Francisco Bay region, Los Angeles, Seattle, Denver, Knoxville, and Portland, Oreg. Research on general and specific landslide problems was continued in the Lake Roosevelt area, Wash., and at the Fort Randall reservoir in South Dakota. The Survey contributed to the efforts of the Committee on Landslide Investigations, Highway Research Board, which is preparing a report on landslides and engineering practice.

In addition to the basic mapping program, several special geologic studies were undertaken for other Federal and State agencies. These included a landslide investigation at the naval radio station at Arlington, Wash.; study of foundation conditions near a naval ordnance station; study of foundation conditions near Colorado Springs, Colo., for the Federal Housing Administration; and a cooperative study with the Colorado Highway Department of geologic conditions along a road being relocated near Marshall, Colo.

General Geology

General geologic activities embrace studies in volcanology, metamorphism, tectonics, sedimentation, glaciology, surficial geology, and the geology of soils. Many of these studies are related to general mapping projects in areas where potential mineral resources are as yet unknown.

During the year, general geologic field activities included 24 studies in 16 States, the Aleutian Islands, and the Territory of Hawaii. The knowledge gained from mapping and studying the geology of uranium- and phosphate-bearing formations in South Carolina and Florida will be most important in the search for new deposits of these minerals.

The Hawaiian and Aleutian projects are concerned chiefly with the mapping and studying of volcanoes and volcanic rocks, but in the Aleutians strategic terrain studies were made for the armed services. During the year two volcanic eruptions were studied. In July 1953 Mount Spurr, on the Alaska Peninsula, had a brief but violent eruption and showered ash on the city of Anchorage. The results of these ash falls and the potential danger of future falls were studied and reported on. In late May and June 1954 a 5-day eruption of Kilauea volcano on Hawaii was studied in great detail by the staff of the Survey's permanent observatory on that island. One of the chief objectives of the observatory staff is to learn enough about volcanic processes to predict eruptions more accurately and thus save human lives.

Geophysics

The objectives of the geophysics program are to assist in the solution of geologic problems by the use of the methods and techniques of physics and mathematics. The program consists of field and laboratory studies of the physical properties and behavior of earth materials and associated theoretical and experimental investigations, the development and modification of geophysical instruments and methods used in the search for mineral resources and in geologic studies, and the compilation of reference material. Field investigations include both airborne and ground surveys.

In the past year, two aircraft were operated. Airborne radioactivity surveys totaling about 30,000 traverse miles in 8 States were made for uranium- and thorium-bearing materials. Large radioactivity anomalies led to the discovery of ore-grade material in north-central Arizona and in the Black Hills of South Dakota. Aeromagnetic surveys were made in 6 States and Alaska.

Ground surveys by one or more of the standard gravity, magnetic, seismic, or electrical methods, were made in 10 States, in Alaska, and in Greenland to obtain information on subsurface structure or stratigraphy in investigations of mineral deposits and water supplies, and in military and engineering studies. Regional geophysical studies were underway in the Mojave Desert area of California and in the Colorado Plateau. In the Mojave Desert, gravity and aeromagnetic surveys have yielded valuable information on the geologic structure underlying alluvium. The studies of the Colorado Plateau are aimed at gaining a fuller understanding of the regional geology than can be obtained from surface studies alone, and of learning whether there is a relation between regional geologic features and the occurrence of uranium.

Development of new instruments and modification of existing equipment have been undertaken to meet the requirements of special geologic studies. Included among these are instruments for measuring thermoluminescence and the magnetic properties of rocks, and scintillation counters for use in cars, light aircraft, and in drill holes. A major contribution has been the development and successful testing of a shallow-reflection seismograph. The seismic-reflection method has heretofore been used only in detailed structural mapping at depths greater than 500 feet, where it has accounted for a high proportion of new oil discoveries in recent years. The shallow-reflection method developed by the Survey makes possible detailed mapping in the depth range of 50 to 1,000 feet. This method is expected to be of great value in exploration for minerals and in ground-water and engineering studies.

Theoretical and experimental studies during the year included those of the scattering and absorption of gamma radiation, of the relationship of negative magnetic anomalies to the chemical and mineralogic composition of rocks, of the thermal properties of permafrost and the effect of buildings and other construction on permafrost, and of the methods of interpretation of total-intensity aeromagnetic maps.

Geochemistry and Petrology

Chemical and spectrographic analysis, mineralogic and petrographic examination, radioactivity determinations, and X-ray and other examinations were made of nearly 100,000 specimens, including the preparation of about 15,000 thin and polished sections of rocks and minerals.

Notable advances were made in the application of X-ray fluorescence to determination of elements such as niobium, thorium, and selenium, in the development of spectrographic and chemical methods for thorium and the rare-earth elements, and in the perfection of a simple and rapid field test for germanium. A trailer laboratory equipped for field geochemical prospecting was put in operation. Ceramic equipment was developed for grinding samples without contamination by traces of foreign metals.

In the search for guiding principles in exploration of mineral resources, much basic research on processes of mineral formation has to be done. One achievement toward this goal was the first practical trial of a direct method of determining the atomic structure of crystals, in which the structure of the boron mineral colemanite was calculated by the new Hauptman-Karle method with punched-card machines. Others are the completion of a systematic guide to identification and occurrence of uranium and vanadium minerals of the Colorado Plateau; experimental synthesis of complex uranium and vanadium minerals; development of apparatus for studying acidity and oxidation changes in ores leached by natural waters; development of new methods of determining the age of rocks from their zircon and monazite compositions; and development of methods for estimating temperature of formation from liquid inclusions in crystals. In the first year of its operation, the laboratory for age determination by radiocarbon analysis has obtained results that contribute substantially to clarifying the confusion in assigned sequences of glacial events of the late Pleistocene era. Two mass spectrometers were put into operation for studying processes of mineral deposition by measuring isotopic atoms as clues to migration and diffusion, and for determining ages of formation.

A beginning was made toward applying modern statistical methods to problems of field geology.

Paleontology and Stratigraphy

Survey specialists in the past year completed 117 reports of investigation presenting basic information on the distribution of fossil faunas and floras, on paleoecology, and on biogeochemistry—information essential for the solution of many problems in applied geology. Fifty-three of these reports have already been published.

More than 40,000 fossil specimens from 31 States, Alaska, and 14 areas outside the continental United States were examined by these specialists and the resulting information incorporated in 504 factual and interpretive reports. These reports are mostly for immediate use by Geological Survey and other Federal geologists and for eventual inclusion in publications by them.

Faunal studies of the subsurface rocks of the Williston basin area of the Dakotas and Montana are well advanced and reports on the Carboniferous and Ordovician faunas are in semifinal draft. Special research in support of strategic mineral studies such as the fissionable materials program, as well as studies of a more general nature, was continued.

Geologic Investigations in Alaska

Survey activity in Alaska during the year was focused on study and evaluation of the mineral resources of the Territory, with emphasis on strategic and critical minerals and on sources of oil and coal. Investigations of construction materials for military and civilian use, and studies of engineering problems of Federal and Territorial agencies constituted an increasing part of the Alaskan work.

Studies completed in the Yakataga district in fiscal year 1954 included discovery of oil seepages in the Samovar Hills where structural conditions are favorable for entrapment of oil and discovery of evidence of a significant continuation of a long-known major fault associated with oil seepages. Elsewhere, petroleum studies were continued in the Nelchina area and preliminary studies were begun in the western part of interior Alaska and in previously unstudied parts of the Alaska Peninsula. Office compilation of the results of the field investigation in northern Alaska was continued.

Coal investigations were continued in the Little Susitna district of the Matanuska coal field, and geologic guidance was again furnished a Bureau of Mines drilling program at Wishbone Hill in the Matanuska coal field.

Mineral-deposits investigations in progress included continuation of exploratory geologic mapping and reconnaissance for mineral resources in the lower Kuskokwim region; a dip-needle survey of a magnetite area near Klukwan, southeastern Alaska; continued study of copper mineralization, supplemented by photogeologic techniques, in the Prince William Sound area; detailed studies of tin deposits in the western part of the Seward Peninsula; examination of areas of scheelite mineralization near Nome; application of geochemical prospecting techniques to an antimony deposit near Ketchikan; and investigation of a copper prospect on the upper Maclaren River. In addition, cooperative investigations with the National Park Service were carried on at Katmai National Monument.

Engineering geology activities were on a broader and more systematic scale than in previous years. Studies were made of four potential power sites on the Kenai Peninsula; the route of the proposed Denali highway and several critical engineering-geology problems were examined for the Alaska Railroad.

Reconnaissance surveys for fissionable materials continued and a radiometric laboratory was maintained during the prospecting season at College, Alaska. Compilation, based on existing geologic information, and supplemented by photogeologic study, was begun of preliminary geologic quadrangle maps at a scale of 1:250,000.

Military Geology

Military geologic investigations of the Geological Survey are aimed at providing technical advice on geology, soils, and associated terrain conditions for the Armed Forces. These investigations have become increasingly diversified. The original program, begun in 1942, is still active. It resulted, during the year, in the preparation of 47 comprehensive studies of foreign regions and many more special reports and maps. There were also many direct consultations, such as briefings for military personnel about to begin technical assignments in foreign countries, and advice to military units in the United States on problems involving consideration of geologic conditions.

As a part of the extensive field program in the western Pacific region, in progress since 1946, the detailed mapping of geology and water resources of Guam was completed in November 1953. In addition, the regular but unscheduled part of the program included special consultation for United States Army, Navy, and Air Force units in Guam and Japan on various geologic problems relating chiefly to construction and water supply.

A second field program dating from 1946 is concerned with geologic and associated terrain conditions in Arctic and subarctic regions, particularly Alaska. During the year, field surveys were conducted in Alaska in the Bristol Bay area, southwestern Copper River Basin, central Kenai Peninsula, Susitna-Maclaren district, and along the Iliamna Tote Road from Cook Inlet to Iliamna. Comprehensive military geologic reports were prepared on St. Lawrence Island, the Seward Peninsula, and the Delta River region of Alaska, based on field investigations in previous years. In Greenland, the survey participated in a field project of the Corps of Engineers and Transportation Corps, United States Army.

For the second consecutive year, special assistance was provided to United States Army headquarters in Germany and Austria. Consultations were held on the preparation of terrain studies and a map was prepared of a selected area that will serve Army personnel as a model for making further special-purpose terrain evaluation maps.

Besides giving advice on specific problems, the Survey also furnishes general guidance for military personnel in the use of military geologic reports and maps. For example, a course of instruction was given in the advanced training program for officers at the Engineer School, Fort Belvoir, Va. The removal of a security classification makes it possible to reveal now that the Survey prepared the Army

Technical Manual TM 5–545, Geology and its military applications, published in August 1952. This manual is the only one of its kind in the United States. It is used for technical guidance on military geology by all the military services.

Foreign Geologic Investigations

The Geological Survey's foreign mineral resources studies began in 1941 under the Inter-Departmental Committee on Scientific and Cultural Cooperation with the American Republics and have continued under the sponsorship of the Foreign Operations Administration during fiscal year 1954. Geological investigations were in progress in 16 countries in South America, the Near East, and Asia. In some of these countries geologists worked closely with the geologists from the host country and their findings were published under joint authorship. The long-range purpose of giving scientific and technical assistance in the field of geology to friendly foreign countries is to aid them in discovering, assessing, and developing their mineral resources for the benefit of themselves and the free world.

In Mexico, Peru, and Brazil the long-range mineral resource studies were continued in cooperation with government geologists from those countries. A geologic engineering study was begun at La Paz, Bolivia, in cooperation with city and national officials, for the purpose of city planning to counteract landslide conditions. A general reconnaissance assessment of the mineral potential of Colombia and Ecuador was completed in cooperation with the Servicio Geologico Nacional and the Department of Mines, respectively. Cooperative work continued with the Corporacion de Fomento del Chile in the establishment of a Chilean geological survey as a means of carrying out a countrywide minerals investigation and development program. Cuban and Geological Survey geologists began extensive field investigations of chromite deposits in that country, with emphasis placed on geophysical methods of exploration. Geologic reconnaissance and mapping of western Saudi Arabia in a cooperative search for ground water and minerals were continued. A reconnaissance evaluation of reported occurrences of metallic mineral deposits of Iran and Israel, in cooperation with mineral-resource agencies of those governments, was continued through 1954. A field survey and final analysis of metallic mineral deposits of Egypt were completed to aid the Egyptian Government in its effort to establish a long-range plan of mineral development. One geologist continued as technical adviser to the Geological Survey of India in its field investigations of manganese and other mineral deposits. In the Philippines the Survey and the United States Bureau of Mines continued their cooperative work with the Philippine Bureau of Mines in a long-range program of minerals and fuels investigation and development. Two Survey geologists began reconnaissance studies of the minerals and fuels resources of Taiwan, in cooperation with the Chinese Nationalist Government. In response to a request from the King of Jordan, a study of the oil possibilities in Jordan was made.

Technical assistance in minerals investigations was continued in Puerto Rico, in cooperation with the Puerto Rican Economic Development Administration.

A total of 34 promising young technicians, leaders, and specialists in the fields of mineral investigations and supporting sciences received on-the-job training in the Survey's domestic field program. These technicians from Afghanistan, Brazil, Burma, Chile, Colombia, Cuba, India, Mexico, Norway, Paraguay, Peru, and the Philippine Islands received not only training in the technical aspects of the work, but also a thorough review of the Survey's administrative practices and organizational procedures in long-range planning for countrywide geological surveys.

Geologic Maps

The Office of Geologic Cartography, in conjunction with the field units, prepared about 2,300 geologic maps, charts, diagrams, and other illustrations, many of them for multicolor reproduction. Final copy for 19 maps in the geologic quadrangle series, 4 mineral investigations maps, 30 fuels maps, 2 geophysics maps, and 4 State geologic maps were transmitted to the Map Reproduction Branch. Fifty-nine other multicolor maps are in various stages of preparation.

The geologic-map editor reviewed and edited 3,074 maps and other illustrations, involving 272 reports. About 77 percent of these illustrations were designated for publication by the Geological Survey; the rest were sent to cooperating State and Federal agencies and scientific journals for publication.

Library

In all activities the Geological Survey Library had its busiest year. About 24,000 items were added to the main library in Washington and much material was acquired for the branch libraries in Denver, Colo., and Menlo Park, Calif. The Denver branch moved into its new quarters in August 1953 and the Menlo Park branch quarters were occupied in January 1954.

Circulation of material in the main library included about 40,000 items loaned to Survey personnel and 4,000 items to other libraries; about 4,000 items were borrowed from other libraries for Survey use.

An estimated total of 72,000 items were used in the library itself. Many of the loans were made outside of Washington to widely dispersed Survey personnel; however, about 19,500 visits were made to the library by Survey employees and about 2,000 visits by others.

The Survey's priceless photographic library, ill housed in Washington, was shipped to Denver in June. It will occupy fireproof, controlled-humidity space as a part of the Denver branch library.

Manuscript preparation of the 1951 volume of the "Bibliography of North American Geology" was completed, and accelerated progress was made on the 1952–53 volume and the cumulative volume for 1940–49. In addition, the 1954 volume was kept current.

TOPOGRAPHIC DIVISION

The Topographic Division has as its primary objective the completion of an atlas of large-scale (1:62,500 and 1:24,000) topographic maps of the United States, its Territories and possessions. A secondary objective is to maintain the usefulness of the maps by periodic revision. In addition to these specific objectives, related activities such as the preparation of special maps, control surveys, research, and satisfying requests for map information, are all important functions of the Division.

Since it was created in 1879, the Geological Survey has published about 16,000 different topographic atlas sheets which cover about 69 percent of the area of continental United States. Many of the older maps which were made to meet less stringent requirements than those existing today are of limited use. Many of these maps are in need of revision, and some of the areas covered should be completely remapped. However, about 33 percent of the total area of the 48 States is covered by topographic maps of good quality.

During the fiscal year ending June 30, 1954, there were 1,436 quadrangle maps transmitted to the Publications Office for printing and distribution. Of these maps, 1,031 represented new mapping by the Geological Survey, 200 were Geological Survey revisions of existing maps, and 80 were new maps compiled by other agencies and, by interagency agreement, published and distributed by the Geological Survey. The remaining 125 were civil editions of maps which had been compiled previously and published for military use by the Department of Defense. The total area covered by this year's new mapping is about 3 percent of the total area of continental United States.

The Federal mapping program continued to be directed toward national defense requirements, about 50 percent of the productive capacity of the Division having been utilized to meet the immediate map needs outlined by the Department of Defense. The 6-year program for mapping of strategic areas, begun by the Division in fiscal year 1951, was further expanded in keeping with additional priority requests received from the Department of Defense and with program adjustments effected in conference with military officials.

A slight decrease in the total funds available for topographic mapping during the past year is reflected in a decrease in personnel. The strength in terms of permanent personnel of the four regional offices at Arlington, Va., Rolla, Mo., Denver, Colo., and Sacramento, Calif., decreased from 2,004 average man-years in 1953 to 1,896 this year, or approximately 5 percent. In spite of this reduced strength, the output of the Division, measured in square miles of completed map compilation and revision in the continental United States, increased from 83,100 to 103,500, or about 25 percent. Of these 103,500 square miles, about 16,000 were in the revision program; this is about the same amount of revision as reported for fiscal year 1953. This increase in production resulted in part from an overall increase in efficiency due to a more stable working force and more efficient procedures.

In fiscal year 1952, contracts for 15,821 square miles of stereocompilation services, including some control, were awarded to commercial mapping organizations. Of this total, about 6,000 square miles were completed in 1953 and 9,300 in fiscal year 1954, leaving about 500 square miles to be done to complete the contracts. The work of completing the testing of the maps and acceptance of all contract work should be finished during the first quarter of fiscal year 1955.

Technical assistance was extended to other nations through agencies concerned with international cooperation under the Mutual Security Act of 1951 as amended. This included the assignment of specialists in photogrammetry and topographic mapping to Burma, as well as the training of foreign technicians and the supervision, inspection, and testing of map compilation. In addition, the Divison provided technical advice on mapping and photogrammetry to these agencies and to the United Nations.

Mapping Programs and Map Production

Mapping or map revision was carried on during the year in all the 48 States and in Alaska, Puerto Rico, the Virgin Islands, and the Hawaiian Islands. Federal-State cooperative programs, whereby mapping costs are shared equally between the Federal Government, and a State, county, or municipality, were conducted in the 30 States of Arizona, Arkansas, California, Colorado, Connecticut, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New York, North Dakota, Ohio (Mahoning County), Oklahoma (Tulsa County), Pennsylvania, Tennessee, Texas (city of Austin), Utah, Vermont, Virginia, Washington, and Wisconsin, and in Puerto Rico. Arizona is a recent addition to the list, having last participated in cooperative mapping in 1927. The Survey also continued to cooperate with the Tennessee Valley Authority in completing the topographic mapping of the valley. This work has no relation to the Tennessee State cooperative program, which includes only those areas outside of the Tennessee River basin.

During the year new defense requests were received from the Air Force for the mapping of 70 military bases, requiring some 40,000 square miles of new mapping. While these new requests will further delay the mapping of some areas for which there are urgent civilian requirements, the mapping of Air Force bases will also serve to provide maps needed in connection with the nonmilitary development problems that may arise in the highly populated areas adjacent to some of the bases. The civilian needs, as reported by Federal agencies and State advisory committees, are being coordinated and weighed so that, as the mapping for defense requirements continues to slacken, new mapping programs may be begun in those areas representing the greatest civilian need for topographic mapping.

A bright spot in the meeting of civilian requirements is the cooperative mapping program of the Federal Government and the State of Kentucky. This program, providing for the preparation of uniform statewide coverage of 7½-minute topographic maps at the scale of 2,000 feet per inch, is now in its fifth year and about 90 percent complete. A total of 328 of these maps have been published, and advance copy is available for most of the other areas of the State, as well as aerial photography for the entire State.

Mapping in the Territory of Hawaii was continued for the publication of topographic maps at the scale of 1:24,000. Operations during the year were conducted on the islands of Oahu, Molokai, and Maui on a total of 31 quadrangles covering an area of 1,360 square miles. Four of the five quadrangles covering the island of Molokai have been published and the fifth is nearing completion. It is planned to extend this mapping program to the island of Hawaii at an early date.

In Alaska, the accelerated mile-to-the-inch mapping program was continued, but the scale of operations was reduced somewhat. This accelerated program was begun 3 years ago in accordance with military requirements. This series of maps will also provide long-needed detailed terrain information for civil improvements, such as pulp and lumber operations, transportation routes, power developments, and mineral investigations.

Mapping on this scale (1:63,360) was continued on 409 Alaskan quadrangles covering an area of about 80,000 square miles. Actual accomplishment, in terms of stereocompilation, was about 20,000 square miles, and 90 quadrangle maps were published, bringing the total of published maps of this series to 233.

Revision was begun on some of the 1:250,000-scale topographic maps of the provisional series of Alaska where new mile-to-the-inch mapping has been completed. Revision of the popular Alaska Map E, scale 1:2,500,000, was also begun.

In order to expedite the large-scale mapping program in Alaska, a coordinated program was worked out with the Department of Defense under which the 30th Engineers performed all of the field surveys in certain areas required for the Geological Survey compilation of 1:63,360-scale maps. Preliminary discussions have taken place concerning the possible extension of this type of cooperation for areas in the United States.

A mapping program was begun in the Virgin Islands in cooperation with the Office of Territories. Aerial photography has been received, and control surveys are in progress for the preparation of topographic maps to be published at the scale of 1:24,000.

Under a new cooperative agreement with the Department of Public Works of the Commonwealth of Puerto Rico, a program for revising the 1:30,000-scale topographic map series of Puerto Rico has been initiated. To carry out this program a resident engineer has been established in Puerto Rico, with headquarters in San Juan, to direct the continuous revision of these maps.

At the present time about 16,000 published topographic quadrangle maps are available. Many of these maps produced in earlier years are in need of revision to maintain their maximum usefulness. At the time these maps were produced they adequately portrayed the terrain and cultural developments and they have served effectively, but the rapid development of the country in recent years, with the construction of highways, urban expansion and attendant man-made changes, has greatly reduced the usefulness of these maps. By a program of revision and the expenditure of less than 10 percent of the cost of new mapping, most of these maps can be brought back to full value and maximum usefulness. Such a program, on a continuing basis, is proposed. The revision project in Puerto Rico, which is set up as a continuous program under a resident engineer, represents the type of solution contemplated for this problem.

Publication and distribution of a civil edition of the 1:250,000-scale maps of the United States were continued. These maps constitute a provisional series of 468 sheets being compiled by the Department of Defense (Army Map Service) for military purposes. Publication of the civil edition will provide reconnaissance topographic maps of many areas for which no topographic information of any kind has heretofore been available to the general public. One hundred twenty-two maps of this civilian edition have been published and are now available, including five maps covering the Hawaiian Islands.

A new base map for the State of California at the scale of 1 : 500,000 was published, and similar base maps for Missouri and New Mexico are in the proof stage. Base maps on the 1 : 500,000 scale for New York, Oregon, Pennsylvania, Tennessee, and Colorado are in various stages of compilation, and similar maps for Arizona, North Carolina, and Virginia have been authorized. State maps at the 1 : 1,000,000 scale were published for the States of Indiana, Wyoming, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut, and a similar map of California is nearing completion.

To provide the framework for topographic mapping and for other engineering purposes, 11,580 miles of monumented lines of third-order leveling were completed during the year, together with 5,474 miles of transit traverse and a comparable amount of third-order triangulation. The results of such control surveys are available to the public.

In 1954, contracts were let for 112,509 square miles of precision aerial photography for topographic mapping purposes. This represents an increase of about 41,000 square miles over the amount of photography for which contracts were made in the previous fiscal year. In addition, arrangements were made with the Air Force to procure a quantity of aerial photography for use in compiling maps of a number of Air Force bases within the United States. The Navy Department and the Air Force deployed photographic crews to Alaska to obtain additional coverage necessary for the cooperative program of mapping in Alaska.

During the year, photography of more than 115,000 square miles was completed and delivered. Some of this work had been contracted for in the previous fiscal year. The unit cost of the aerial photography was 21 percent less than the cost in fiscal year 1953.

The Special Maps Branch continued to prepare charts for the United States Air Force Aeronautical Chart and Information Center, and special maps for other agencies of the Federal Government. The work for the Air Force consists of the photogrammetric compilation and revision of base charts, and the scribing of color-separation negatives preparatory to lithographic reproduction. These charts are an integral part of the national defense program, as well as the overall program of the Air Force for the production and maintenance of adequate worldwide coverage of aeronautical charts. About 240 assignments were completed. These included the compilation of 52 charts covering about 268,000 square miles, the preparation of 26 shaded relief plates, the scribing of color-separation negatives for 47 charts, and the completion of 115 other special assignments. The 52 charts compiled included 213,000 square miles of entirely new photocompilation and 55,000 square miles of revision and cartographic compilation. These projects covered areas in practically every part of the globe. In addition, the Special Maps Branch completed 27 special assignments for other governmental agencies. Of these, 15 were compilation of maps covering approximately 5,000 square miles for the Geologic Division, the Atomic Energy Commission, and the Office of Naval Petroleum Reserves, and 7 were color-separation scribing for the United States Air Force, the Geologic Division, and the Mutual Security Administration. The Special Maps Branch also performed the color-separation drafting of the Water Resources Development Map of the United States.

New mapping and map revision in the United States (excluding Alaska) for each of the major phases of mapping activity are as follows:

	New mapping (square miles)	Map revision (square miles)	Total (square miles)
Photography			115, 400
Horizontal control			71, 000
Vertical control			54, 700
Supplemental control			66, 550
Stereocompilation (including 9,300 square miles by contract)			75, 800
Field compilation	81, 125	17, 600	98, 725
Drafting			84, 100
Transmitted for reproduction	120, 150	12, 600	132, 750

In addition, relief shading was completed for 10 quadrangles and 3 State maps.

The total opposite each phase in the foregoing tabulation represents approximately the annual accomplishments of the Division. Variations in these totals are due to changes in backlogs and to work done on projects in which only certain phases of activity were concerned. In the fiscal year, work was in progress on 6,000 quadrangles. It usually requires from 2½ to 5 years to survey a quadrangle and publish the map of it.

Topographic maps forwarded for reproduction total 1,436. Of these, 1,146 were 7½-minute quadrangles, 289 were of the 15-minute series, and 1 was a 30-minute quadrangle. In addition, the Division prepared reprint editions of 647 quadrangle maps, 26 State base maps, and 58 State index maps. At the close of the fiscal year, 717 maps were in process of reproduction, including 227 reprints. During the year, 1,975 quadrangle maps were published, including 598 reprints. Of the 1,377 new and revised maps, 51 were compiled by the Tennessee Valley Authority, United States Coast and Geodetic Survey, and Forest Service, and 195 were civil editions of Army maps previously compiled for military use. In keeping with established policies, the topographic map material produced by these agencies is published and distributed to the general public by the Geological Survey.

A detailed summary of production covering new mapping, remapping, and revision, is shown in the following table:

Areas (in square miles) mapped during fiscal year 1954 for publication on standard scales

[Contour intervals, 5 to 100 feet]

State	Area mapped, scale			New mapping	Revised mapping	Total
	1:24,000	1:31,680	1:62,500			
Alabama						
Arizona	3		1,320	585	738	1,323
Arkansas	61			61		61
California	9,205		6,107	10,276	5,036	15,312
Colorado	1,065			1,065		1,065
Connecticut		1,101		439	662	1,101
Delaware	637			381	256	637
District of Columbia						
Florida	4,788			4,788		4,788
Georgia	841			841		841
Idaho	193		1,320	1,513		1,513
Illinois	1,959		469	1,501	927	2,428
Indiana	1,941		6	1,647	300	1,947
Kansas	174			174		174
Kentucky	12,146			12,146		12,146
Louisiana	676		506	1,182		1,182
Maine	138		1,600	710	1,028	1,738
Maryland	996			122	874	996
Massachusetts		689			689	689
Michigan	564		757	1,237	84	1,321
Minnesota	1,248		1,044	2,292		2,292
Mississippi			617	617		617
Missouri	758			704	54	758
Montana	761		18	779		779
Nebraska	1,374			1,374		1,374
Nevada	125		1,970	2,060	35	2,095
New Hampshire	28		573	534	67	601
New Jersey	1,924			48	1,876	1,924
New Mexico	2,908		104	3,012		3,012
New York	3,437		1,547	4,584	400	4,984
North Carolina	149		760	760	149	909
North Dakota	647			647		647
Ohio	1,855			1,855		1,855
Oklahoma	58			58		58
Oregon	411		2,789	3,200		3,200
Pennsylvania	1,815		2,318	2,017	2,116	4,133
Rhode Island		36			36	36
South Carolina						
South Dakota	3,070		76	3,146		3,146
Tennessee	887			887		887
Texas	544		3,609	4,153		4,153
Utah	615		3,064	3,679		3,679
Vermont			1,397	214	1,183	1,397
Virginia	594		798	921	471	1,392
Washington	1,876		3,805	5,061	620	5,681
West Virginia	2			2		2
Wisconsin	546		586	1,132		1,132
Wyoming	3,470		25	3,495		3,495
Total	64,489	1,826	37,185	85,899	17,601	103,500
Alaska			[1] 19,582	19,582		19,582
Puerto Rico		[2] 66		3	63	66
Hawaii	446			446		446

[1] Mapped on a scale of 1:63,360.

[2] Mapped on a scale of 1:30,000.

Research and Development

Culminating a decade of photogrammetric research, the Survey has adopted newly developed equipment for using twin low-oblique photography and will begin countrywide use of it late in 1954. The principal instruments which make twin photography feasible are the ER–55 (ellipsoidal reflector projector of 55 mm. principal distance) and the Twinplex plotter. Prototypes of these instruments and related auxiliary equipment were designed and developed in the Survey's Staff Photogrammetry Section for these two principal purposes: to lessen the amount of ground-survey work required as compared to that required for mapping from conventional vertical photographs, and to give greater accuracy by widening the angle of intersection of rays in the stereoscopic model. By fiscal year 1956 many twin low-oblique photography mapping projects will be underway in each region, and it is expected that eventually most of the photography for all conventional mapping will be of the twin low-oblique type.

Perfection of the twin low-oblique photogrammetric method has been attained by an integrated program of research and development in photogrammetric mapping which includes the following major elements:

(1) Use of twin low-oblique photography instead of the conventional vertical photography. Twin low-oblique photography has inherent advantages that can lead to substantial economies, if suitable instruments are available for its use. By June 30, 1954, about 9,000 square miles of twin low-oblique photography was under contract, and photography of 2,300 square miles had been delivered.

(2) Development of photogrammetric plotting instruments suitable for using twin low-oblique photography. This development has been two-fold: the ellipsoidal reflector (ER–55) projector was developed to provide an efficient solution of the optical and mechanical problems posed by twin low-oblique photography; and the Twinplex plotter was developed as a means for extending control for mapping with twin low-oblique photography, using ER–55 projectors in coupled pairs. The ER–55 projector also provides a greatly improved means of utilizing conventional vertical photography. Contracts for the fabrication of ER–55 projectors and Twinplex plotters were let and the first commercially built models were approaching completion at the year's end, with complete delivery in prospect for the fall of 1954.

(3) Development of improved diapositive printers for printing at each of the three principal reduction ratios: 153:30, 153:55, and 153:153. These printers utilize aspheric correction plates for compensating aerial camera distortion. Two 153:55 printers, needed for use with the ER–55 projectors, will be delivered in the summer of 1954.

(4) Procurement of high-precision aerial cameras of the latest design, featuring a virtually distortion-free lens and several mechanical improvements. Ownership of these cameras by the Survey assures adequate control of their technical characteristics. Ten of these cameras have been delivered.

(5) Installation of a multi-collimator camera calibrator to permit expeditious testing and calibration of aerial cameras used in work of the Geological Survey. This equipment was completely delivered in fiscal year 1954.

(6) Development of a precision pantograph to permit the compilation of map detail at or close to the publication scale. Pantographs for use with Kelsh plotters are scheduled to be delivered in the summer of 1954, and some for use with Multiplex and ER–55 instruments are scheduled for fall delivery.

(7) Development of techniques and procedures for using the new equipment, including the publication of instructions and scientific papers.

Further progress was made toward the integration of negative engraving, or scribing, to replace the drafting process in map-finishing operations. This has involved the development and refinement of instruments of various kinds, improvement of engraving emulsions, and continuous search for better materials and methods. It is expected that the orderly conversion of all drafting offices to the negative scribing process can be completed during the next fiscal year.

In view of the advantages indicated for the scribing procedure in map finishing, experiments with its application at stereo-compilation and field-survey stages have been undertaken. Results have been generally favorable and steps are now being taken for the gradual conversion of stereomapping and field-survey procedures to scribing. The benefits expected therefrom are associated with, and interdependent upon, the endeavor to simplify the mapping process as a whole. This involves the plotting of basic data at reproduction scale, or as close thereto as feasible, which, in turn, requires special supplementary equipment and some reorganization of personnel and procedures. Completion of the conversion will therefore probably require 1 or 2 years, but the prospects of ultimate simplification of the mapping cycle, time reductions, and overall saving clearly justify this effort.

The Special Maps Branch has achieved considerable success in extending horizontal control through the use of the stereotemplet method whereby fewer points are required to control any given area. Since the completion of an experiment in an area in Louisiana, the method has been used in other areas where the flight pattern of the photography, the ruggedness and inaccessibility of terrain, and the scarcity of existing horizontal control precluded the achievement of an equally accurate solution by other techniques.

A joint committee of the Geologic and Topographic Divisions was organized for the purpose of exploring means of applying photogrammetric methods to operations of the Geologic Division. Among the measures recommended by this committee was the establishment of a training course for geologists in the use of photogrammetric techniques as related to photointerpretation and cartography in the field of geology. Two such courses were conducted in the spring of 1954, and other courses were planned for the fall.

Twelve more chapters of the Topographic Manual were published during the year, bringing the total to 42. Sixty-seven chapters are in various stages of preparation, and it is estimated that the project is about 50 percent complete.

A detailed study of appropriate contour intervals for use in planning future mapping was continued on a State-by-State basis. Four State plans have been completed and approved and ten others are currently in progress.

Map Information Office

Public use of the facilities of the Map Information Office continued to increase considerably during the year but there was not so great an increase as in the previous year. Nevertheless, nearly 60,000 requests for maps, geodetic control data, and aerial photographs, or related information, were serviced.

New map files have been installed and storage facilities are now available for more than 100,000 maps. The fourth edition of the index map showing the status of topographic mapping in the United States was issued. Many requests for geodetic control data resulted in the distribution of about 15,000 copies of horizontal and vertical control data assembled in 15-minute-quadrangle units. Large requests were primarily from geologic and geophysical survey companies and aerial photomapping firms.

Aerial photography sales of 144,525 reproductions amounted to $87,875, an increase of about 40 percent over the previous year.

Three new training films were delivered to the Map Information Office for circulation: Supplemental Control for Topographic Mapping, Triangulation for the Control of Topographic Mapping, and Negative Scribing for Map Reproduction.

In cooperation with the four regional offices, the Map Information Office supplied 78,000 copies of preliminary map manuscripts. Most of the requests for these were from oil companies and from consulting engineers or mapping contractors interested in new turnpike planning, uranium and oil exploration, and microwave propagation studies. A constant interchange of map, control, and photographic information with other Federal agencies also was conducted.

WATER RESOURCES DIVISION

Water has often been referred to as "our Nation's most important natural resource." It is also one of our most elusive resources. In streams and underground it is constantly varied through operation of the circulating system whereby water in the sea and on the land is transferred to vapor in the air and is then precipitated back upon the earth. This process is continuous, but because the rate varies, the water supply in any one locality is always changing. Those with an expert knowledge of water agree that the United States should know much more about its water supply and its water requirements and that a proper, scientific, and systematic appraisal of our water resources is necessary for the wise development of our economy. This appraisal is the work of the Water Resources Division of the Geological Survey. Throughout the Nation the Geological Survey, in cooperation with the 48 States and other Federal agencies, is planning, working on, and completing investigations designed, eventually, to locate and describe our water resources. These investigations will determine the amount of water available, the quality of the supply, the areas it serves, and the extent it can be developed without depleting the supply or impairing the quality.

Water-resources investigations are financed from directly appropriated funds, funds transferred from other Federal agencies for work performed directly for them, and from funds provided by States and municipalities for cooperative investigations. Funds made available by States and municipalities in 1954 for cooperative studies were:

State:	*Obligations*
Alabama	$76,234
Arizona	108,914
Arkansas	52,994
California	316,835
Colorado	56,115
Connecticut	22,309
Delaware	17,588
Florida	135,298
Georgia	61,002
Idaho	57,325
Illinois	49,240
Indiana	108,057
Iowa	80,211
Kansas	57,629
Kentucky	145,405
Louisiana	93,817
Maine	10,972
Maryland	80,985
Massachusetts	43,556
Michigan	93,569
Minnesota	86,685
Mississippi	40,650
Missouri	32,814
Montana	33,100
Nebraska	71,514
Nevada	30,376
New Hampshire	$17,891
New Jersey	80,182
New Mexico	130,188
New York	210,527
North Carolina	88,662
North Dakota	36,348
Ohio	128,748
Oklahoma	72,831
Oregon	67,912
Pennsylvania	120,178
Rhode Island	14,804
South Carolina	27,957
South Dakota	10,248
Tennessee	85,679
Texas	247,083
Utah	103,142
Vermont	8,010
Virginia	82,788
Washington	111,746
West Virginia	23,735
Wisconsin	41,338
Wyoming	49,389
Guam	18,658
Hawaii	82,172
Total	3,823,410

Water-resources investigations are carried on by 102 principal field offices which, for administrative and reporting purposes, operate as parts of the Surface Water, Ground Water, or Quality of Water Branches. A comprehensive investigation of water resources requires the coordinated activities of these Branches.

Surface-Water Investigations

The task of measuring the flow of even a few of the Nation's streams is a large one which requires the collection of a vast amount of statistical data.

Records of stream discharge were collected at 6,400 gaging stations in the 48 States and in Alaska, Hawaii, and Guam during fiscal year 1954. The stations were operated through 44 district offices, in cooperation with 187 agencies of States and their political subdivisions and with 15 Federal agencies. These records are published in the annual series of water-supply papers entitled "Surface Water Supply of the United States."

The Federal Power Commission requires licensees operating major hydroelectric-power generating systems to measure the flow of streams used in producing power. At the request of the Commission the Geological Survey supervised stream gaging on nearly 200 licensed projects during 1954.

The making of one compilation of all streamflow records in the United States, begun in 1952, was 45 percent complete at the end of 1954. This project consists of reviewing, revising, and condensing all streamflow records collected before 1950. The complete records for any given gaging station will be summarized in one volume. During the year, 2 of the 20 volumes were completed and sent to the printer; these were for the Colorado River basin and the New England area.

Four flood reports were published during the year, and three others were completed and delivered to the Government Printing Office. Four reports relating to water resources of specific areas were released to cooperating State agencies for publication. The results of a laboratory study of flow through bridge openings was published as Geological Survey Circular 284, Computation of Peak Discharge at Contractions. A flood-frequency report for Iowa, prepared cooperatively by the Geological Survey, was published by the Iowa State Highway Department.

The number of cooperative agreements with State highway departments was increased during the year. Hydraulic data on 86 sites where bridges are to be built were furnished to various State highway departments. Flood-frequency studies were in progress at the end of the year in 9 States; studies were completed in 2 other States, and reports are in process of publication. The program of collecting flood-flow data on small streams by means of crest-stage gages is being augmented continuously.

Streamflow data are generally required as the bases for the apportionment and division of interstate waters. Eleven interstate compacts providing for such apportionment are now in effect and three are under negotiation. These compacts include provisions for the establishment and operation of gaging stations, usually by the Geological Survey.

The Geological Survey, using funds transferred by the Department of State, made water-resources investigations along the Canadian boundary that are required by the Boundary Waters Treaty of January 11, 1909, between the United States and Canada, or by orders issued by the International Joint Commission.

Ground-Water Investigations

Investigation of the ground-water resources of the Nation was continued throughout the fiscal year. In addition to the 43 State cooperative programs there were more than 30 other projects for study of ground-water problems that are primarily of national interest or of direct concern to some other Federal agency.

Programs of national interest that were begun or continued in the year include, among others, research on artificial recharge in Arkansas, designed to produce information that will make this method of ground-water replenishment more practical under conditions now considered too difficult; studies of the hydrology of mining areas in Alabama, Arkansas, Tennessee, Pennsylvania, Michigan, Wisconsin, and Nevada, designed to produce fundamental information enabling economical dewatering of mines now too "wet" to work profitably; a reconnaissance of the Nation to outline areas where saline ground waters will be available for demineralization by the various water-desalting techniques now being studied by several scientific agencies and universities; study of water-loving plants in the arid West to determine where they waste water that can be salvaged for useful purposes; and study of ground-water movement in deep aquifers and its effect on the accumulation of oil and gas. These studies, even where limited to given geographical areas, have nationwide application.

Continuing investigations of particular interest to agencies of the Federal Government include broad areal studies in Alaska, in central Arizona, in the Central Valley of California, in the Arkansas, White, and Red River basins, in the New England-New York river basins, on the island of Guam and in the Trust Territories of the Western Pacific, and in the Columbia River basin.

Other surveys and investigations have been conducted at the request of the Armed Forces, the State Department, the Agriculture Department, the Atomic Energy Commission, and various bureaus of the Department of the Interior.

During the year, 70 reports of ground-water investigations were published and 99 others were made available to the public by means of open-file release. The published reports consisted of 7 water-supply papers, 2 hydrologic atlases, 20 circulars, and one congressional document, 20 reports published by cooperating agencies, and 20 papers published in scientific journals. In addition, several reports were prepared for various Federal agencies.

Chemical-Quality Investigations

All water, whether surface or ground water, contains some dissolved minerals, which may be a limiting factor in the uses to which the supply may be put. An integral part of the change water undergoes in its progress through the hydrologic cycle is the persistent alterations in the chemical quality. The type of material with which the water has been in contact and the length of time in contact govern the degree of mineralization and ultimately the use of the water. Water of unsuitable quality will affect adversely every phase of human living.

The object of the Survey's chemical-quality investigations is to determine the quantity and character of the mineral matter in solution in ground and surface waters as a prerequisite to the selection and development of industrial, municipal, and agricultural water supplies. The investigations involve an intensive and extensive sampling of ground- and surface-water sources and are conducted in close coordination with the studies of ground and surface waters in order to arrive at an understanding of the full potential of the water supplies in any area.

During the year, the chemical quality of more than 85,000 samples of water was determined in 15 laboratories situated in Washington, D. C., and throughout the country. The national program consisted of chemical-quality studies of the streams in the Colorado River, Pecos River, and Columbia River basins, in the New York-New England States, and in Alaska. Also Federal network sampling stations were maintained on western streams to determine trends in mineral content and thus help to insure successful operation of existing irrigation projects. Chemical-quality studies of surface waters were conducted in cooperation with various State agencies in 17 States. These programs include the daily collection of surface-water samples at 227 sites on streams. In addition, samples were collected on an intermittent basis at nearly 200 stream-sampling sites. More than 6,000 samples were also collected and analyzed in connection with cooperative studies of ground water in those areas and in other States.

In the sound development of Federal projects and for the protection of Federal property, data on water quality are of increasing importance in order to provide a better understanding of the use of water for national defense, public health, agriculture, industry, and recreation. Analytical results, interpretation of analyses, or advice about water problems were furnished during 1954 to the following Federal agencies: Atomic Energy Commission, Department of the Navy, Department of the Army, Department of the Air Force, Maritime Administration, Public Health Service, Veterans' Administration, Bureau of Reclamation, Bureau of Mines, Public Housing Administration, Federal Works Agency, and Fish and Wildlife Service. Nearly 4,000 analyses were made at the request of these agencies; and nearly 1,600 of the samples analyzed were collected at defense installations in this country and at offshore bases.

Much public attention has been directed to the prospective use of demineralized saline waters for industrial and other purposes. Concerted efforts on the part of public and private agencies have produced results that are encouraging for the conversion of saline water, especially water of lower saline content than ocean water, to fresh water at a cost competitive with existing supplies in areas where the current price is substantially above average.

This raises the question, Where are the major sources of these inland saline waters? The Geological Survey is currently engaged in trying to find out. During 1954 two reports were partly completed: One deals with a reconnaissance study of the saline waters of the United States and will summarize existing information; the second covers in somewhat greater detail the saline water resources in Texas.

A program to determine radioactivity of water and interpret the occurrence of radioactive substances in waters throughout the United States entered the data-collection phases during the latter part of the year. An analytic laboratory to further this program was placed in operation.

Sediment Investigations

Sediment transported by streams poses a problem in the design and operation of water-control structures. The useful life of such structures may be threatened in a few years by the deposition of sediment. The demand for construction of large dams to impound greater quantities of water in reservoirs for irrigation, power development, and industrial use, has focused attention on the probable useful life of these reservoirs.

Because the greater part of the sediment carried in streams is dropped in the reservoirs, it is essential that systematic studies be made to determine the quantities of sediment that will have to be taken into account in the construction of dams and in the operation of the reservoirs. The sediment-measurement studies involve to a considerable degree the determination of the sediment transported by a stream at a given site. In 1954, sediment samples were collected daily, or more frequently, at 127 sites throughout the Nation. The national program of sediment-transport studies was advanced in mainly the Rio Grande, Colorado, and Missouri River basins. Cooperative sediment studies were continued in the States of Kentucky, Ohio, Pennsylvania, and Virginia. In all, more than 50,000 sediment samples were collected and analyzed during the year in 15 laboratories throughout the country.

Missouri River Basin

As a part of the coordinated Missouri River basin development plan, comprehensive investigations of the water resources of the basin were continued during the year. In general, these investigations were carried on at a reduced rate as compared to 1953.

Research

The design of a high-speed electronic computer for processing surface-water records is practically complete and construction well under way by a private firm. It is expected that the computer will perform a large volume of work of a routine nature that has been performed manually.

Research is being conducted in both the field and laboratory on the technique of computing peak discharges through natural channels and new designs of hydraulic structures. Work on flow through bridge openings has been completed and the results published; work on flow through culverts and over dams is now in process.

A battery-powered electronic low-velocity flowmeter, built for the Geological Survey, was delivered near the end of the year. The meter is to be used for measuring flows which the standard mechanical current meter does not measure with sufficient accuracy. It is now being tested under field conditions.

Several noteworthy achievements in ground-water technology were made during the year. The development of numerical methods of analysis for the solution of complex quantitative ground-water problems was continued. The use of electrical models to solve ground-water problems involving complex boundary conditions was increased. These developments are growing out of a new conception that will enable the water supply of ground-water reservoirs to be evaluated on an areal basis more easily and yet with more accuracy than heretofore. A working model of an electrical "slide rule" was constructed for quickly determining theoretical drawdowns caused by pumping. A new type of meter that appears to determine moisture content in soil more accurately than previous methods was tested for application to analysis of ground-water problems involving determination of movement of water through the unsaturated material above the water table.

Two field tests were made during the year to determine how radioactive wastes are dissipated when introduced into a stream. Disposal of radioactive wastes will become a major problem as use of atomic power increases, and one means of disposal is to discharge the wastes into surface waters. Research was continued on the development and refinement of techniques for collecting and analyzing water samples for radioactivity.

A study which has been made of the origin and development of meandering, braided, and straight natural stream channels has resulted in a number of generalizations concerning the formation of each type and in the prospect that they can be interpreted in terms of rational laws. These studies are important in the control and regulation of rivers, as well as in the broad field of geologic processes.

Industrial Water Supply

Present-day industrial plants require immense quantities of water. In 1953, industries utilized about 45 percent of all water used, exclusive of that expended for development of water power. The water must be of suitable quality. Studies of the quantitative and qualitative water requirements of industry that were carried on in 1953 were continued in 1954 at the request of the Water and Sewerage Industry and Utilities Division of the Business and Defense Services Administration of the Department of Commerce. Field investigations of the water requirements of the carbon black industry were completed. Administrative reports for the use of defense agencies were begun on the rayon, acetate, nylon fiber, aluminum, and carbon black industries. A report on the water requirements of the pulp and paper industry was prepared for publication to serve the dual purpose of providing information for national defense planning and to render a valuable service to business and industry.

Water-Resources Evaluation

At the request of the National Security Resources Board the Division is engaged in preparing integrated reports summarizing and evaluating water-resources information in specific areas. In 1954, reports were published on six large industrial centers, and reports on eight additional centers were in progress. The reports are designed to supply answers to questions on industrial, municipal, and rural water supply, flood protection, and pollution control. All available water-resources data are summarized, interpreted, and evaluated for the areas, including location, quantity, quality, temperature, and utilization of both ground-water and surface-water supplies, flood and low-flow frequencies, flood profiles, and effects of existing and proposed reservoirs.

Technical-Assistance Program

Water-resources investigations and training of foreign nationals under terms of the Mutual Security Act were continued as a part of the Foreign Operations Administration program in India, Iran, Saudi Arabia, Afghanistan, and Libya, and additional personnel were assigned to the last two countries. New ground-water investigations were begun in Egypt and Pakistan.

Nationals of India received training in domestic field offices.

Under the auspices of the United Nations, a preliminary water-resources investigation was made in Jamaica, and surface-water studies in cooperation with the Geological Survey of Jamaica are now in progress.

Soil and Moisture Conservation

The soil- and moisture-conservation program provides the facts needed to protect water supplies on Federal lands of the West under the custody of the Department of the Interior and to maintain the productivity of these lands. During 1954 the Survey's program included prospecting for and discovery of new sources of range-water supplies on public lands in the arid and semiarid areas, thus permitting better utilization of these lands. Investigations that were begun in 1952 to determine the rate at which reservoirs were being filled with sediment, as a measure of the erosion taking place upstream, were continued in 1954. These surveys also showed the extent to which water was wasted by evaporation. Results of the Lake Hefner, Okla., investigation to develop basic methods for measurement of evaporation from reservoirs were published in 1953. The principles of this successful research are being applied at Lake Mead, the key reservoir in the management of lower Colorado River. Studies are under way near Fairbury, Nebr., to determine whether similar principles can be applied to the measurement of water lost by vegetation through evaporation and transpiration.

CONSERVATION DIVISION

The Conservation Division classifies Federal lands as to mineral and water resources and supervises mineral-recovery operations under leases, permits, and licenses on Federal, Indian, and naval petroleum reserve lands. A small headquarters staff and a field staff of competent geologists and engineers are maintained. This force makes field surveys, prepares maps and reports dealing with waterpower, fuels, minerals, and chemicals essential to the mineral-resource economy of the United States, and conducts onsite supervision of mining and drilling operations necessary to assure the safe and economical production by private enterprise of coal, oil, gas, and other minerals.

Mineral Classification Branch

All services rendered by the Mineral Classification Branch were maintained at a continued rapid pace throughout the fiscal year 1954. In all, 21,721 cases were acted upon. They concerned the outright disposal of Federal lands with no reservation of any mineral, the disposal of such lands with the reservation of one or more specified minerals, or the exercise under the Federal leasing laws of the Government's right to lease for exploration and production by private enterprise, one or another mineral substance from lands under its jurisdiction. In addition, the Branch prepared and promulgated initial or revised definitions of the known geologic structure of 52 producing oil and gas fields containing Federal lands; appraised geologically 215 unit-plan and participating-area proposals; drafted 9 determinations of leasehold relations to the productive limits of producing oil and gas deposits as found to exist on August 8, 1946; reported for appropriate administrative action the fact and geologic significance of 150 new discoveries of oil or gas made on or affecting Federal-land leaseholds; recommended the competitive sale of oil and gas leases on 31 parcels of public land; reviewed and reported upon 16 appeals from decisions of the Bureau of Land Management affecting the disposal of Federal lands; and prepared 128 miscellaneous reports on the mineral potentialities of specific lands for various agencies of the Federal Government and inquiring individuals.

From field offices in Colorado, California, Montana, New Mexico, Oklahoma, Utah, and Wyoming, Branch and district geologists made "demand" or specific investigations which resulted in geologic reports and maps for official use. The Branch completed reports on the coal resources of Rifle Gap coal district, Colorado; on the oil and gas resources of Middle Dome-Kettlemen Hills, Williams, and Republic areas, Midway field, and Wheeler Ridge, Calif.; Twin Buttes gas field, and Clear Creek gas field, Colorado; Block 36 gas field, Grand Bay field, Romere Pass field, and East Greenwood field, Louisiana; Greenwood field, Kansas; East Popular field, Montana; six fields in southeast New Mexico; East Orlando field, Oklahoma; Sussex-Meadow Creek field, and West Salt Creek field, Wyoming; on sodium classification at Searles Lake, Calif., and in the Green River Basin, Wyo.; on occurrences of phosphate rock at Buck Creek, Wyo., Bear Creek, Idaho, and Midway, Utah; on the occurrences of lead, zinc, and iron deposits in the Clark National Forest, Mo.; and on geology of dam and reservoir sites on the Chowchilla River, Calif.; and on the Eileen and Meadow Creek dam sites on the Moyie River, Idaho; maps showing classifications of oil and gas lands in California, Colorado, Nebraska, New Mexico, South Dakota, and Utah; and a special report on structure and oil and gas occurrences in southeast New Mexico.

Water and Power Branch

The Water and Power Branch conducts investigations to determine potential waterpower possibilities, classifies public lands having value for development of waterpower projects, and works closely with other bureaus and agencies in administration of the public lands so classified. These duties are carried out from a central and regional office in Washington, D. C., and from regional offices in Denver, Colo., Sacramento, Calif., Portland, Oreg., and Tacoma, Wash. Investigatory work in Alaska is directed from Tacoma. Field work during 1954 was directed mainly toward obtaining basic information on the waterpower resources and storage possibilities of Federal lands in Alaska, California, Colorado, Idaho, Montana, New Mexico, Oregon, and Washington. Field projects during the year included surveys on the Kenai, Kasilof, and Seldovia Rivers, Alaska; Klamath, North Yuba, Sacramento, McCloud, Chowchilla, and Scott Rivers, Calif.; Navajo and Arkansas Rivers, Colo.; Moyie River, Idaho; Yaak River, Mont.; Navajo River, N. Mex.; South Fork Coos, Wilson, and Trask Rivers, Oreg.; and Wynoochee River, Wash. In all, 280 channel miles of stream and 11 dam sites were mapped during the year or were under investigation on June 30, 1954. Maps of 98 channel miles of stream and 10 dam sites were published during the year; maps awaiting publication on June 30 include 170 channel miles of stream and 5 dam sites; maps in the office stage of preparation on June 30 include 70 channel miles of stream and 4 dam sites. Four reports were published as circulars and seven reports were in preparation for publication on June 30. They include an appraisal of waterpower possibilities of streams in Alaska, California, Colorado, Idaho, Nevada, and Oregon. Classification activities resulted in the addition of 225,137 acres to power site reserves and elimination of 4,030, increasing the outstanding reserves in 23 States and Alaska to a net total of 7,163,559 acres. Upon request from the Federal Power Commission supervision was given to power projects under license and to 757 such projects under permit or grant from the Department of Interior, and to 203 in cooperation with the Bureau of Indian Affairs. Action involving hydraulic determination was taken on 5,806 cases received from departmental sources and the Federal Power Commission.

Mining Branch

The Mining Branch supervises operations concerned with discovery, development, and production of coal, potassium, sodium, phosphate, and oil shale from public domain lands; of sulfur on public lands in Louisiana and New Mexico; of silica sand on certain lands in Nevada withdrawn by Executive Order No. 5105; of gold, silver, and mercury on certain Spanish land grants; of all minerals, except oil and gas, on restricted allotted and tribal Indian lands, on "acquired lands" under the act of August 7, 1947, and provisions of section 402 of the President's Reorganization Plan No. III of 1946, on land in the California State Park under the act of March 3, 1933 (47 Stat. 1487), and on national forest land in Minnesota under the act of June 30, 1950 (64 Stat. 311). Outstanding mineral leases and permits on "acquired" and Indian lands and lands subject to the aforementioned acts involve the exploration for and production of aluminum, cobalt, copper, gold, iron, lead, manganese, silver, nickel, titanium, tungsten, uranium, vanadium, zinc, asbestos, bentonite, clay, coal, garnet, gravel, gypsum, feldspar, fluorspar, limestone, marble, mica, phosphate, pumice, quartzite, quartz crystal, sand, silica sand, sulfur, and vermiculite.

The Branch is responsible for investigations and reporting on applications for leases and prospecting permits; recommending lease terms, enforcing compliance with lease terms and of regulations governing the conduct of prospecting, mining, and beneficiation; protecting and conserving the natural resources by preventing waste; determining royalty liability; preparing statements and receiving payment of royalties and rentals. The Branch also acts in an advisory capacity to the Office of the Secretary, other bureaus of the Department, and other Government agencies. As of June 30, 1954, there were under supervision 1,462 properties involved in leases, permits, and licenses in 32 States and Alaska, of which 867 were on public lands; 199 on acquired lands; and 396 on Indian lands.

Production from such lands under supervision during the fiscal year is estimated at 17,920,676 tons, valued at $119,396,653, with royalties amounting to $4,482,876. The production of coal from Federal land in the United States and Alaska aggregated 7,185,482 tons. Production of coal in Alaska was 800,700 tons. Potash production amounted to 7,481,000 tons of crude salts valued at $52,196,000 and having royalty value of $2,049,000. The principal source of sodium was Searles Lake, Calif.; it accounted for 564,655 tons of the total of 662,762 tons of sodium and associated compounds produced from lands under supervision. Phosphate rock and shale production was 1,329,145 tons—545,381 tons from public domain, 4,816 from acquired lands, and 778,948 tons from Indian lands. Production of lead and zinc concentrates from Indian lands amounted to 15,400 tons valued at $1,578,000 and having royalty value of $135,250. The output of uranium and vanadium ores from Indian lands was 168,693 tons valued at $5,783,310 and having royalty value of $619,664. Phosphate, coal, and sand and gravel made up the major part of the rest of the production from Indian lands, totaling 1,759,617 tons valued at $9,527,080 and having royalty value of $880,221. Coal, fluorspar, zinc, asbestos, bentonite, phosphate, mica, quartzite, quartz crystals, stone, and sand and gravel were produced from acquired lands in 10 States to an aggregate of 225,480 tons valued at $2,276,884 and having royalty value of $76,800.

Oil and Gas Leasing Branch

The Oil and Gas Leasing Branch supervises operations for the discovery, development, and production of crude oil, natural gas, and products extracted from natural gas on Federal and Indian lands. These duties were carried out during the year by means of 5 regional offices and 20 district offices at 19 separate locations in California, Colorado, Louisiana, Montana, New Mexico, Oklahoma, Utah, Wyoming, and Washington, D. C. On the public lands 87,531 oil and gas properties were under supervision at the end of the fiscal year, aggregating 65,959,426 acres in 23 States and Alaska. Drilling on public lands during the year included the spudding of 1,524 wells and the completion of 1,503 wells, of which 1,097 were productive of oil or gas. In all, 20,403 wells, including 11,587 capable of oil or gas production, were under supervision on June 30, 1954. Production was appreciably greater than in 1953, amounting to about 107,963,116 barrels of petroleum; 238,438,986,000 cubic feet of natural gas; and 200,765,386 gallons of gasoline and butane, with royalty returns to the United States of about $37,801,929. There were 2,873 acquired land leases, embracing 2,758,629 acres in 29 States under supervision at the close of the fiscal year. Drilling on acquired lands during the year included the spudding of 74 wells and the completion of 81 wells, 39 of which were productive of oil or gas. In all 445 acquired land wells, including 222 capable of oil or gas production, were under supervision on June 30. Including compensatory royalty allocated to the Rio Vista gas field, the production from acquired lands was about 4,919,000 barrels of petroleum; 2,757,269,000 cubic feet of natural gas; and 117,209 gallons of gasoline and butane, with royalty returns of about $1,998,324.

The Branch supervised operations on 9,937 leaseholds, embracing 2,666,070 acres on Indian lands in 17 States, which contained at the end of the year a total of 8,314 wells, 4,431 of which were productive of oil or gas, and 387 of which had been completed in the year. The total revenue from royalties, rentals, and bonuses amounted to $27,728,000. Outstanding on June 30 were 12 protective leases issued to protect from drainage Federal lands subject to leasing (national monuments, military reservations, etc.). Forty-six productive wells have been drilled on these leases, and royalty returns for the year were more than $585,000. On behalf of the Department of the Navy, supervision was continued over the production of oil, gas, gasoline, and butane from 17 properties under lease in Naval Petroleum Reserve No. 2 in California. Production from 272 active wells in this reserve totaled 2,198,000 barrels of petroleum; 1,665,000,000 cubic feet of natural gas; and 9,668,000 gallons of natural gasoline and butane, with an aggregate royalty of $949,000. Activities toward unitization of oil and gas operations involving Federal land were reflected in the approval of 80 new unit plans during the year and the termination of 48 previously approved unit plans, leaving 301 approved plans, covering 5,240,893 acres, outstanding. About 50 percent of the petroleum obtained from public lands during the year was produced under approved unit agreements, as were 23 percent of the natural gas and 59 percent of the gasoline and butane. No Indian land unit agreements were approved during the year, but a total of 11 such approved plans covering 87,320 acres were outstanding on June 30. Also, 120 drilling unit, or communitization, agreements were approved during the year, making a total of 386 approved as of June 30.

WORK ON PUBLICATIONS

The primary purpose of the Geological Survey is to provide for the people and the agencies of Government information necessary for the exploration, development, and conservation of our mineral and water resources. As this information becomes available through investigations, surveys, and research, the fulfillment of this purpose is served by the publication of a variety of reports, maps, and charts. The information is published in part by the Survey and, in part, by cooperating States, and by many scientific journals. These publications include maps of the topographic and geologic features of the Nation, studies of mining districts and mineral deposits, of the composition and structure of rocks and minerals, of fossils and the rocks in which they are found, of geophysics and geochemistry, and studies of streamflow and ground waters and their chemical quality. Those published in 1954 are summarized below.

Reports, maps, and charts published in fiscal year 1954

REPORTS

Division	Professional Papers	Bulletins and Water-Supply Papers	Circulars	Approved for publication in scientific journals	Approved for publication by cooperating agencies	Placed in open file	Special
Geologic	20	35	52	422	19	66	
Topographic				23		19	
Water Resources	1	30	22	44	32	[1] 104	2
Conservation			4				
Staff							13
Total	21	65	78	489	51	189	15

MAPS AND CHARTS

Division	Topographic quadrangle		Geologic	River survey	Special	Placed in open file	Approved for publication by cooperating agencies
	New	Reprinted					
Geologic			80			42	8
Topographic	1,537	384			[2] 354		
Water Resources					[3] 2		
Conservation				15		1	
Total	1,537	384	80	15	356	43	8

[1] Includes 20 reports approved for publication in scientific journals.
[2] Includes 267 maps and charts produced for publication by other agencies of the Government.
[3] Of the Hydrologic Atlas series.

Section of Texts

The Section of Texts edits and prepares manuscripts for the printer, revises proof, and performs other duties in the publication of professional papers, bulletins, water-supply papers, and circulars. During the year, 225 new manuscripts were received, 234 manuscripts were sent to the printer, and 194 publications were delivered by the printer. Work on these included 21,334 pages of manuscript edited and prepared for printing; 3,287 galley proofs and 8,365 page proofs revised and returned; indexes prepared for 55 publications and totaling 12,370 entries. Copy edited in preparation for mimeographing included 90 pages of miscellaneous material.

Twelve lists of new publications were issued. Also printed during the year was Publications of the Geological Survey, 1953. Copy for the First Supplement to Publications of the Geological Survey, 1953 was prepared.

Section of Illustrations

Of a total of 64 reports on hand at the beginning of the fiscal year, 44 were in various stages of completion. Eighty-two new reports were received, making a total of 146 reports. Of these 85 were completed and transmitted for publication, as compared to 74 last year. This leaves 61 reports on hand, 55 of which are in various stages of completion.

Those transmitted included 37 professional papers, 29 bulletins, 16 water-supply papers, 2 hydrologic atlases, and 1 special map of Panama. These reports contained 2,168 drawings and photographs. Illustrations were prepared for 54 circulars which contained 368 drawings and photographs.

A grand total of 2,436 illustrations were prepared by the Section. In addition, many miscellaneous pieces of drafting were completed for other bureaus of the Department and Branches of the Survey.

Map Reproduction

The production of the Map Reproduction Branch increased more than one-third over the past fiscal year. The following is a summary of its accomplishments:

Topographic Division maps

	New	*Reprinted*
Standard topographic	[1] 1,474	133
Standard topographic (engr.)	6	251
1:250,000-scale	[2] 33	------
Scale conversion	24	------
Planimetric	22	64
State base	15	14
State topographic index	46	------
Status index	3	------
Miscellaneous	1	3

Geologic Division maps

	New	*Reprinted*
Geologic quadrangle	16	------
Mineral investigation	5	------
State geologic index	4	------
Coal	7	1
Oil and gas	20	20
Oil and gas charts	3	------
State geologic	------	7
Geophysical investigation	14	1
Geologic status	2	------
Miscellaneous	9	5

[1] Includes 24 printed by other Government agencies.

[2] Printed by other Government agencies.

Conservation Division maps		
River survey	15	------
Miscellaneous	------	1
Water Resources Division maps		
Miscellaneous	2	------
Total	1, 721	500

These 2,221 new and reprinted map editions comprise 5,740,852 copies and 30,245,194 impressions, of which 5,597,852 copies and 29,387,194 impressions were printed in the Survey's plant. These maps range in size from 17 by 21 inches to 50 by 72 inches.

In addition to the foregoing production, 1,008 jobs comprising miscellaneous maps and other preliminary map services were completed. This printing amounted to 488,572 copies and 2,397,560 impressions, including 73 illustrations comprising 248,061 copies and 1,238,425 impressions for the Government Printing Office. The rest of the miscellaneous printing and service was done for 31 units of the Government, including branches of the Survey and various States. Two well-known items produced were the United States Water Resources Development Map and the Bureau of Land Management Map of the United States. Also, 1,843 type jobs (impressions on cellophane for map preparation) were delivered, and 1,484 maps were mounted on cloth.

The total cost of all production was $1,327,560.11. Of this amount $28,417.54 was received from other agencies for map sales and $50,324.65 was paid by other agencies for printing or service work. The remainder of the cost, $1,248,817.92, was charged directly or indirectly to Survey funds.

A summary of the work accomplished within the Survey's plant is as follows:

1. A total of 6,086,424 map copies (31,784,754 impressions) was reproduced and delivered.
2. The Photographic Process Section prepared 10,528 photolithographic printing plates, and the Hand Transfer Section prepared 1,241 printing plates.
3. The Photographic Laboratory made 13,262 photolithographic negatives; 2,767 photographic negatives ranging from 2 by 2½ inches to 30 by 40 inches; 19,487 prints ranging from 1½ by 2 inches to 40 by 72 inches; developed 65 film packs and 75 rolls of film; made 983 lantern slides; developed and printed 56,665 feet of 35 mm. aerial film; and mounted 651 prints.

Distribution

The Distribution Branch distributes Geological Survey publications through Washington, Denver, and Alaskan units, and distribution operations are also handled by 11 other Survey field offices. Further distribution is carried out by approximately 400 commercial agents who purchase maps for resale to the general public.

Publications received during the year include 269 reports in book and pamphlet form, printed by the Government Printing Office and the Interior Duplicating Section, and 2,221 map publications, listed in the report of the Map Reproduction Branch, or a total of 2,490 publications received.

Total receipts from the sale of maps and folios amounted to $258,776.71, of which $28,417.54 was received from other Federal agencies. The orders involved the receipt and processing of 130,000 individual requests. The number of copies distributed by Geological Survey offices was as follows:

	Maps, folios and indexes
Washington	1, 516, 998
Denver	754, 821
Alaska	43, 134
Other Field Offices	93, 369
Total	2, 408, 322

The following tabulation shows the volume and type of publications received and distributed during the fiscal year. The table also shows the quantity of these materials on hand at the beginning and close of the period.

	On hand July 1, 1953	Received	Distributed	On hand June 30, 1954
Geologic folios	11, 005		1, 025	9, 980
Maps and indexes	24, 174, 925	5, 740, 852	2, 407, 297	27, 508, 480
Books and pamphlets	728, 640	168, 973	203, 267	694, 346
Total	24, 914, 570	5, 909, 825	2, 611, 589	28, 212, 806

FUNDS

During the fiscal year 1954, obligations were incurred under the direction of the Geological Survey totaling $48,485,757. Of this amount 56 percent was appropriated directly to the Geological Survey, 32 percent was made available by other Federal agencies, and 12 percent by States and their political subdivisions.

Obligations incurred by the Geological Survey in fiscal year 1954, by source of funds

Topographic surveys and mapping:	
Geological Survey appropriation	$11, 572, 715
States, counties, and municipalities:	
Reimbursements	1, 613, 967
Direct State payments	42, 800
Bureau of Reclamation	1, 166, 487
Department of the Air Force	868, 482
Department of the Army	259, 495
Department of the Navy	9, 596
Atomic Energy Commission	198, 809
Foreign Operations Administration	43, 762
Government Printing Office—map reproduction	40, 796
Miscellaneous Federal agencies:	
Sale of maps	28, 418
Aerial photographs and photographic copies of records	30, 539
Other	50, 270
Sale to the public of aerial photographs and photographic copies of records	66, 233
Sale of personal property	35, 325
Total	16, 027, 694
Geologic and mineral resource surveys and mapping:	
Geological Survey appropriation	6, 339, 638
States, counties, and municipalities: reimbursements	141, 919
Bureau of Indian Affairs	20, 767
Bureau of Mines	2, 256
Bureau of Reclamation	194, 495
Defense Minerals Exploration Administration	344, 187
Department of the Air Force	23, 823
Department of the Army	1, 067, 560
Department of the Navy	409, 163
Atomic Energy Commission	7, 191, 812
Foreign Operations Administration	451, 248
General Services Administration	72, 921
Government Printing Office—map reproduction	101, 095
Miscellaneous Federal agencies:	
Security classified	98, 163
Other	356
Sale of personal property	7, 014
Total	16, 466, 417
Water resources investigations:	
Geological Survey appropriation	6, 731, 953
States, counties and municipalities:	
Reimbursements	2, 843, 403
Direct State payments	980, 063
Bonneville Power Administration	5, 398
Bureau of Indian Affairs	113, 213
Bureau of Reclamation	807, 323

Obligations incurred by the Geological urvey in fiscal year 1954, by source of funds—Continued

Water resources investigations—Continued	
Fish and Wildlife Service	$6, 625
Office of Territories	14, 317
Department of Agriculture	104, 649
Department of the Air Force	49, 630
Department of the Army	1, 070, 260
Department o fthe Navy	52, 560
Department of State	92, 568
Atomic Energy Commission	260, 568
Tennessee Valley Authority	91, 021
Foreign Operations Administration	229, 142
Miscellaneous Federal agencies	16, 543
Permittees and licensees of the Federal Power Commission	78, 669
Sale of personal property	18, 251
Total	13, 566, 156
Soil and moisture conservation: Geological Survey appropriation	98, 520
Classification of lands:	
Geological Survey appropriation	409, 996
Miscellaneous Federal agencies	53
Sale of personal property	678
Total	410, 727
Supervision of mining and oil and gas leases:	
Geological Survey appropriation	1, 194, 994
Department of the Navy	33, 398
Miscellaneous Federal agencies	646
Sale of personal property	36
Total	1, 229, 074
Development of water wells on public lands: Payments from proceeds of sale of water	850
General Administration: Geological Survey appropriation [1]	686, 319
Summary:	
Geological Survey appropriation	27, 034, 135
States, counties and municipalities:	
Reimbursements	4, 599, 289
Direct State payments	1, 022, 863
Other Federal agencies	15, 622, 414
Permittees and licensees of the Federal Power Commission	78, 669
Sale to the public of aerial photographs and photographic copies of records	66, 233
Sale of personal property	61, 304
Payments from proceeds, sale of water	850
Grand total	48, 485, 757

[1] In addition, funds advanced or reimbursed by other Federal agencies for program expenses bear an equitable share of general administrative expenses. Such charges in 1954 were $444,210.

Bureau of Mines

John J. Forbes, *Director*

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FOREWORD

THE Bureau of Mines, during the past year, continued to perform essential services for a nation becoming increasingly aware of its position as a leading producer of minerals and as a world power deficient in many of the materials necessary for future security.

Stimulated by a growing population and a rising standard of living, the American appetite for minerals has become so great that more than 15 tons of mined products is needed yearly for every man, woman, and child; and many of the high-grade deposits formerly used to satisfy our millions have been seriously depleted by 3 costly wars in less than 4 decades.

Past experience has shown, however, that as we exhausted our rich ores, we usually found ways to use materials of lower grade. We now obtain magnesium from sea water and are approaching commercial recovery of manganese from open-hearth steel-furnace slags. We have learned to burn coal more efficiently. We have also found ways to extract, from relatively abundant sources, such new metals as titanium and zirconium to meet the requirements for unique materials with unusual properties in the defense and nuclear-energy programs and in industry.

By developing more efficient means of recovering and utilizing minerals and mineral fuels, by finding new uses for plentiful materials and substitutes for scarce ones, and by promoting health and safety among workers in the extractive and processing industries, the Bureau of Mines helps to overcome the Nation's mineral-resources problems. It also collects, analyzes, and publishes statistical and economic data on foreign and domestic minerals for use by industry and by Government in planning research and defense programs.

Important advances continued to be made last year in research on fuels and explosives.

The Bureau tested equipment and studied methods for increasing safety and improving production and recovery in both bituminous-coal and anthracite mines and published several estimates of coking-coal reserves. A kerosine-flotation process for cleaning fine coal was substantially improved, and a method was devised for obtaining lightweight concrete aggregages from coal-washery wastes. Six commercial driers went into operation during the year, using a Bureau-developed process to supply dried lignite for pulverized-coal power boilers. Substantial savings resulted from advice given Federal agencies on installing, testing, and operating fuel-burning equipment.

New knowledge was gained during the year on the action of clays at petroleum-production operations, and a study was completed on the properties and behavior of reservoir rocks in Wyoming. The Bureau published 16 reports telling of its research on primary and secondary oil-recovery operations and, at the end of the year, was preparing similar reports on selected fields in 8 States. Research in petroleum chemistry and refining progressed with identification of 40 organic-sulfur compounds from a Texas crude oil, and completion of 1 part of the cooperative study of the stability and compatibility in storage of diesel fuels and diesel-fuel blends. For the second straight year the Bureau produced a record volume of helium.

Laboratory and pilot-plant studies on producing synthetic liquid fuels from coal resulted in development of improved catalysts to speed reactions for both the gas-synthesis and the coal-hydrogenation processes, and methods developed by the Bureau for gasifying coal at atmospheric pressure were applied commercially by industry during the year. Entrained-solids retorting of oil-shale fines produced good yields of high-quality oils that are potential sources of gasoline and chemical raw materials, while other experiments showed that high-octane gasoline usually can be produced by hydrogenation from light gas oils retorted at high temperatures. At Rifle, Colo., gas-combustion retorting tests produced more than 1,000 barrels of oil from 2,240 tons of raw shale, and operation of chemical and thermal refining units was concluded.

The Bureau made 1,921 tests of permissible and special explosives and hazardous chemicals during the year and investigated explosion hazards of 80 different mineral and industrial dusts for the Armed Forces and industry. Schedules for testing explosives, blasting devices, and stemming devices for confining explosives were prepared. Other researchers devised a new method of measuring detonation temperatures.

Research on metallic and nonmetallic minerals progressed steadily. The Bureau continued to seek domestic sources of manganese, examining many mineral properties and conducting drilling investigations at two large low-grade deposits. Besides performing experiments indicating that pig irons of any desired manganese content can be made from low-grade materials, Bureau metallurgists extracted manganese from low-grade ores of Maine. Other ferrous-metals research included experimental smelting of taconite, studies to improve steelmaking techniques, and completion of a drilling project which indicated nearly half a million tons of strategic nickel in the vicinity of a Government-owned plant in Cuba.

The Bureau cooperated with industry to increase recovery from large copper deposits in Michigan and Arizona and worked with the Geological Survey to find ways of reducing costs on zinc-lead exploratory projects.

Drilling conducted for the Atomic Energy Commission indicated commercial quantities of uranium and thorium minerals in several deposits. Special techniques were devised for analyzing radioactive ore samples; progress was made in the development of new methods of producing tantalum-columbium, uranium, and rare-earth metals; and more than 11,000 samples of ore believed to contain fissionable elements were analyzed and evaluated for the AEC. During the year the Bureau developed techniques for recovering beryl from ores in South Dakota and North Carolina, sought ways of obtaining critically short selenium from large low-grade deposits, and remained the principal source of ductile zirconium and hafnium needed for atomic-energy uses.

The Bureau shut down its alumina plant at Laramie, Wyo., in March 1954, after producing about 800 tons of alumina from anorthosite rock and assembling valuable technical and cost data. Successful studies were completed on producing and refining aluminum-silicon alloys from clay and on improving structural properties of magnesium-lithium-aluminum alloys. At its pilot plant in Boulder City, Nev., the Bureau produced 389,256 pounds of titanium metal for the General Services Administration of the Federal Government.

Research was intensified on synthetic mica and block talc, and progress was made in the effort to increase supplies of asbestos, fluorspar, sulfur, and industrial diamonds. The Bureau established testing units underground to increase mining efficiency and continued to participate actively in the Department's river-basin development program for greater utilization of resources.

Continuing its program of promoting health and safety in the mineral industries, the Bureau carried on a vigorous campaign of research, investigation, training, and inspection of individual coal mines.

Although the 1953 coal-mine fatality rate of 0.84 per million manhours was an alltime low, both the bituminous-coal and anthracite industries suffered serious economic setbacks. To help reduce the rising accident and fatality rates that usually accompany such conditions, the Bureau placed increased emphasis on safety training. Nearly 17,000 workers completed the Bureau's 20-hour accident-prevention course for coal miners during the year, and more than 1,000 supervisors and aspirants for supervisory positions completed a similar course requiring 40 hours of attendance. Bureau personnel were specially trained to expand the activities of the Holmes Safety Association, a means of achieving closer coordination and cooperation with industry in promoting health and safety work.

Thousands of samples of mine atmosphere, gas, and dust were analyzed; electrical and diesel equipment was tested for safe use underground; and research was performed and advice given to operators on mine-ventilation and roof-bolting problems. Work continued on flood prevention in the Pennsylvania anthracite region and control of fires in inactive coal deposits.

Under the Federal Coal-Mine Safety Act Bureau personnel made more than 4,000 regular inspections and more than 3,000 special inspections of mines subject to the act's mandatory provisions.

FUELS AND EXPLOSIVES RESEARCH

During the year Bureau tests in anthracite mines equipped with yielding steel props and a high-speed conveyor-operated backfilling device showed that coal removal and backfilling could be accomplished without breaks of roof or surface subsidence. An imported pneumatic backfilling machine also was operated and was found capable of pumping fill material satisfactorily for distances up to about 1,100 feet.

Studies of three imported German coal planers operating in bituminous coal of varying friability, height, and ease of mining indicated that in friable coal that breaks easily from the roof, higher production and better recovery can be achieved with the planers than with conventional mechanized mining. Bureau engineers observing operations with continuous coal-mining machines in 6 States found that average production per man-shift ranged from 13.5 to 70.6 tons with the machines, compared with 9.1 to 39.8 tons with conventional methods.

Estimates of known recoverable reserves of coking coal were published for 5 counties—2 each in Pennsylvania and Kentucky and 1 in Tennessee. Reports for 7 other counties were drafted and investigations continued in Tennessee and West Virginia.

Coal preparation.—Besides finding a way to increase capacity and at the same time reduce power requirements in a kerosine-flotation process for cleaning fine bituminous coal, the Bureau published a report summarizing studies of launder screens used in cleaning and recovering fine sizes of anthracite.

A report was published on the cleaning characteristics of coking coals in Knott County, Ky., reports on other counties were being prepared, and field and laboratory work progressed.

Drying, combustion, coking, and gasification studies.—Six commercial driers began operating at Rockdale, Tex., during the year, using the Bureau's fluidized-bed process to supply dried lignite to pulverized-coal-burning boilers. They performed satisfactorily at design capacities of 50 tons per hour each and at rates down to half this capacity. The first prototype carbonizer was completed and gave excellent results in early tests, producing substantial quantities of tar and light oil, which will be tested for properties and uses.

Pilot-scale fluidized-bed driers and carbonizers developed at Denver were used during the year to make chars and liquid products from several western subbituminous coals and lignites, three Philippine coals, and a Brazilian oil shale.

After testing two coal-gasification methods, the Bureau rejected one as unpromising; it determined critical operating factors for the other and also for a method of re-forming gases to make high-B. t. u. gas. A new method was devised for burning coal-washery wastes to obtain lightweight aggregates for use in concrete mixtures, and a report was published on combustion and gasification of lignite.

Important similarities in the behavior of coking coal in test ovens and in full-scale slot ovens were found through pilot-scale experiments. The Bureau of Mines-American Gas Association test was used to determine yield and quality of various products from 42 American coals and 4 coals from Colombia, South America. Selectively distilled coal-tar pitches were coked in laboratory studies of the basic mechanism of carbonization.

Coal constitution and analysis.—To help develop an international system for classifying low-rank coals, the Bureau cooperated with the Economic Committee for Europe by analyzing samples of lignites and brown coals from Europe and the United States. It also continued to analyze samples of coal, coke, coal dust, rock dust, slags, and other materials in connection with Government coal purchases, Federal coal-mine inspections, and Bureau research. Small-scale assays indicated potential yields of coke (or char) and coal chemicals from low-temperature carbonization.

Services to the Government.—The Bureau continued its advisory services to Federal agencies on installing, testing, and operating fuel-burning equipment continued during the year and demonstrated the effectiveness of certain ammonia compounds and amines in reducing corrosion in return boiler-water lines. Boiler-water samples were examined for Federal agencies, and feed-water testing kits and special chemicals for testing were distributed to agencies needing them to combat costly corrosion in heating equipment. Savings to the Federal Government during the fiscal year from these activities alone are conservatively estimated to be at least equal to the appropriations for the entire Bureau of Mines.

Assistance to State and municipal governments on air- and stream-pollution problems continued, frequently resulting in recovery of valuable products that more than paid the cost of reducing or eliminating pollution.

Coal economics.—Despite heavily increased demands for energy, production of both bituminous coal and anthracite declined steadily during the year, principally because of the shift to oil and natural gas. Serious economic and social problems arose as bituminous-coal output dropped to the level of prewar depression years and anthracite production reached its lowest point since the turn of the century.

The Bureau's statistical and economic research on solid fuels continued to provide clear analyses of factors underlying changes in production, consumption, stocks, and imports and exports of coal and competing energy sources. Complex information was assembled and interpreted for forecasting military and civilian fuel requirements.

Aiding mobilization planning, the Bureau estimated future solid-fuels-industry requirements for steel and other materials and reviewed data on coking-coal production capacity. It also gave other Federal agencies information on coal, coke, coal chemicals, and foreign coal operations and data to various Members and committees of Congress.

PETROLEUM AND NATURAL GAS

Petroleum and natural-gas production.—Clay studies, coordinated between Bureau laboratories in California, Wyoming, Oklahoma, and Pennsylvania, progressed during the year. Much was learned about the function of clays, under various conditions, in oil-well drilling fluids, in completing oil and gas wells, and in petroleum reservoirs where they inhibit oil flow by swelling on contact with encroaching or injected water. Nearing completion is a report on physical properties and behavior of reservoir rocks in an area of Wyoming where such information will be useful in secondary-recovery operations.

Rapid advances in laboratory work during the year led to arrangements for a cooperative field test on use of detergents to increase the efficiency of water flooding of oil fields. Sixteen reports were published, presenting results of research on primary- and secondary-recovery operations. Similar reports are being prepared on selected petroleum fields in Arkansas, California, Kansas, Louisiana, Oklahoma, Pennsylvania, Texas, and West Virginia.

The Bureau's small-diameter well-bore caliper has attracted the attention of the petroleum industry and the Geological Survey; the latter can use it for surveying diamond-drill holes at uranium prospects.

The Bureau closed its laboratories at Bradford and Franklin, Pa., during the year and transferred its staff and equipment to the new Morgantown (W. Va.) Experiment Station.

Petroleum chemistry and refining; thermodynamics.—Studying sulfur in petroleum in cooperation with the American Petroleum Institute, the Bureau identified 40 organic sulfur compounds in fractions from a Texas crude oil, proved the presence of elemental sulfur in many crude oils, and showed that more than 85 percent of sulfur compounds in the higher boiling fractions of oil are of the thiophene type. The 38th in a series of standard samples of high-purity organic sulfur compounds was prepared to aid other researchers.

Accomplishments in thermodynamics research included development of an accurate pressure-volume-temperature apparatus and completion of the following: Low-temperature studies on 15 pure compounds; vapor-heat capacity and heat-of-vaporization measurements for 8 compounds and heat-of-combustion determinations for 13 others; vapor-pressure studies for 5 substances; thermodynamic-property studies on 6 pure materials; a new equation of state for gases; and a new correlation for thermodynamic properties of elemental sulfur.

Also completed during the year was a cooperative study to determine why certain diesel fuels and diesel-fuel blends deteriorate in storage. Besides showing that oxygen must be present for gum formation, the Bureau determined some of the effects of nitrogen, sulfur, polar materials, and metallic constituents in the fuels.

In cooperation with the American Petroleum Institute the Bureau published surveys of motor gasolines and aviation and diesel fuels and considered the feasibility of a survey of burner-fuel oils. Advances were made in a study of the autoignition characteristics of diesel fuels.

Analyses of 165 new crude oils were completed, and reports were published on those in Oklahoma, the Spraberry, Tex., area, and the Big Horn and Williston Basins of Wyoming, Montana, and North Dakota. Reports on Colorado and California will be issued soon.

Petroleum and natural-gas economics.—Partly because of efforts to increase capacity for producing, transporting, and refining petroleum to provide for emergencies, total stocks of crude oil and products at the end of 1953 were 8 percent higher than a year earlier. Although industry's operations reached new records, crude-oil production and domestic demand were up only 3.4 and 2.8 percent, respectively.

Total proved reserves of crude petroleum increased during the year to an alltime high of 28,945 million barrels, or about 1.4 barrels for each 1 produced. More than 48,000 new wells were completed, a new record.

Marketed production of natural gas during 1953 was 8,425 billion cubic feet—5 percent greater than in 1952—and new reserves developed were almost 2½ times the volume of production.

Helium.—Operating all 4 of its helium plants, the Bureau produced a record 170 million cubic feet of the light, nonflammable gas for Federal agencies and private users. The increase of 20 million cubic feet over that produced in fiscal 1953 was due to greater demands from Federal agencies for defense purposes.

Furthering its search for new sources of helium, the Bureau analyzed samples of natural gas from newly opened fields and made engineering studies of several areas to determine whether they could supply a new helium plant. Other research concerned increasing efficiency of helium production, distribution, utilization, and conservation, with special emphasis on improving the output of present production units.

Synthetic Liquid Fuels

During fiscal 1954 the Bureau concentrated on laboratory and pilot-plant studies to develop basic information industry will need in producing high-quality liquid fuels from coal and oil shale. Coal-to-oil demonstration plants at Louisiana, Mo., were turned over to the Army for disposal, and facilities at the Gorgas, Ala., project for gasifying coal underground remained in standby condition throughout the year. At year's end funds were authorized for reactivating the Gorgas project to test a "Hydrafrac" process that opens a coal seam for gasification.

Oil from coal.—More durable catalysts for the gas-synthesis process and more active ones for the coal-hydrogenation process were developed at the Bureau's Bruceton, Pa., laboratories.

Steam consumption was reduced by using a hot, concentrated potassium carbonate solution instead of conventional ethanolamine solutions to remove carbon dioxide from fresh and recycled synthesis gas under pressure. High yields of aromatic gasoline were obtained with relatively low hydrogen consumption in several small-scale runs with the one-stage hydrogenation process.

In a study of the chemical behavior of metal carbonyls, complexes of a cobalt carbonyl with various acetylene derivatives were prepared, which seemed similar to the unstable complexes formed on the surface of gas-synthesis catalysts. Investigation of the coal-hydrogenation mechanism continued with coalification of pure chemical compounds during heating and reaction with acids, mild oxidation and subsequent pyrolysis of natural coal, and X-ray and spectrometric analyses of natural and artificial coals and coal residues.

Methods for gasifying coal at atmospheric pressure, developed by the Bureau at Morgantown, W. Va., were adopted on a commercial scale by industry during the year, and the Bureau reduced this phase of its gasification program after more than 50 tests on 4 American coals. Important progress was made at Morgantown in developing a pressure gasifier which promises to reduce costs in operations requiring compressed synthesis gas. Efforts to improve purification methods resulted in an analytical procedure for determining carbonyl sulfide in the presence of carbon disulfide, ethyl mercaptan, and thiophene. Activated carbon proved effective in removing hydrogen sulfide from synthesis gas, and water scrubbing in a packed column reduced dust concentration in gas.

Oil from oil shale.—Studies advanced during the year on the properties and composition of oil shale and shale oil and the principles involved in processing them.

Good yields of high-quality oils were obtained from oil-shale fines in the Bureau's entrained-solids retort at Laramie, Wyo., which can be operated at various temperatures, producing oils with a wider range of qualities than those made in countercurrent retorts. Because they are far more aromatic, oils retorted at high temperatures are possible sources of premium-quality gasoline and aromatic chemical raw materials.

In cooperation with the Atomic Energy Commission, oil shale from Tennessee was processed in the entrained-solids pilot retort, and the products were analyzed. The pilot retort also was used to determine yields and quality of oils from Brazilian shale, which is difficult to process because of its high moisture content.

Work to determine the constitution and chemical structure of kerogen—the organic material of oil shale—was intensified, and additional assays were made to provide data on oil-shale reserves. Experiments with light gas oils produced at high retorting temperatures showed hat these oils generally can be hydrogenated to yield high-octane gasoline.

In the first 5 runs in a 150-ton-a-day gas-combustion retort at Rifle, Colo., 2,240 tons of raw shale was processed to produce 1,075 barrels of oil. Some problems encountered in the large unit may be solved in the 6-ton-a-day pilot plant, which was used during the year to study process variables. An intermediate 25-ton-a-day unit was nearly complete at the end of the year. Gas-combustion retorting tests were made on shales from Chattanooga, Tenn., and Brazil to supplement ntrained-solids tests conducted at Laramie.

Operation of the thermal and chemical refining units at Rifle ended with processing shale oil from the gas-combustion retorts to compare its refining characteristics with those of "N-T-U" crude from previous retorts. An extended run of the thermal unit provided operating facts that will be useful in a commercial plant.

Nearly 58,000 feet of oil-shale samples was collected during the year in Colorado, Utah, and Wyoming. Safety was increased in the experimental oil-shale mine at Rifle by installing a new ventilating fan and more than 4,000 roof bolts. Mining research further proved the effectiveness of rotary drilling, developed more durable drill bits that made it possible to drill at higher speeds, and indicated that as little as one-half pound of explosives is needed per ton of shale blasted.

Explosives and Explosions Research and Testing

Explosives research.—The Bureau made 1,921 tests of permissible and special explosives and hazardous chemicals during the year; 176 explosives were on the active permissible list at the end of the year. The quantity of permissible explosives used in coal mines dropped about 9 percent below the previous year, corresponding to an 8-percent drop in coal production. The ratio of permissibles to black blasting powder was 18 to 1—a new high.

Standards for testing explosives, blasting devices, and stemming devices were prepared, and chemochol—a blasting device based on a new principle—was tested and approved for use in coal mines.

Preliminary experiments showed that oxygen content of explosives is a good criterion of permissibility. A new method was developed for measuring detonation temperatures in terms of the light emitted by exploding solid charges, and heavy nitrogen atoms were used to study decomposition of the cellulose nitrate molecule. Application of chromatographic techniques to explosives analysis was resumed.

Gas- and dust-explosion research.—Explosion hazards of 80 mineral and industrial dusts were investigated during the year, and a study was made to determine conditions under which coal cuttings can be stored safely underground. Water sprays and hinged troughs filled with water or limestone dust proved effective in arresting flame propagation in ducts and preventing secondary explosions.

Investigation of explosive properties of flammable gases, vapors, and sprays continued, with emphasis on aircraft fuels under conditions of high-altitude flight. High-speed photography was used successfully to observe detonation processes in carbon monoxide-oxygen and hydrogen-oxygen mixtures.

Advances were made in developing and applying techniques for quantitative study of laminar and turbulent flames. Kinetic studies of the oxidation and decomposition of the relatively simple formaldehyde molecule added another link in the theory of combustion, and microscopic observation of the slow combustion of carbon at atomic levels progressed. Research was continued for the gas industries on burner design and efficient gas-fuel utilization.

MINERAL DEVELOPMENT

The need for raw materials for military purposes and demands for many mineral commodities, already receding, dropped even more sharply following the Korean armistice. However, unrest continued elsewhere and made a continued defense buildup imperative; requirements for many strategic metals and minerals thus remained high. Without relaxing its program to develop readily accessible sources of materials essential to defense, the Bureau of Mines began, where possible, to devote attention to long-range technologic and scientific problems of those industries in which demand is leveling off.

Advice on the conduct of the Bureau's mineral-development program was obtained from the chief mining engineer and the chief metallurgist.

During 1954 the Bureau's mining research was appraised and new investigations were recommended, two of which are already under way in cooperation with industry. The Brazilian Government received advice on oil-shale mining problems, research and mining methods and costs were discussed with representatives of foreign technical missions, and consultant service was extended to the Corps of Engineers on an excavation project near Camp Ritchie, Md.

The Atomic Energy Commission's drilling and exploratory practices on the Colorado Plateau were appraised, and a project was conducted for AEC to determine minable reserves of uranium ore in the Chattanooga shales of Tennessee. For the General Services Administration a Canadian copper mine being developed under a loan from the Export-Import Bank was examined, and supervised exploratory work was undertaken by the Bureau to determine reserves of nickel ore at Nicaro, Oriente, Cuba.

Through frequent meetings with members of other Federal agencies and representatives of industry and friendly foreign governments, the Bureau keeps constantly informed on new developments in metallurgy. Information on metals and minerals is maintained, and, by regular correspondence and periodic visits to Bureau experiment stations, these findings are relayed to metallurgists in the field.

The Bureau is represented on many industrial and governmental committees and boards, including the Materials Advisory Board of the National Academy of Sciences. The chief metallurgist, as a member of this board, helped to prepare reports on industrial-diamond conservation, salvage of high-alloy scrap, materials needed for gas turbines for the Nike guided missile and for high-temperature alloys, new magnesium alloys, recovery of cobalt from copper ores of Turkey, recovery of nickel, cobalt and chromium from lateritic ores, and the status of titanium production processes.

Visiting Manila for the Foreign Operations Administration, the chief metallurgist gave advice on the type of metallurgical industry that should be organized to create employment and stabilize the Philippine economy. He also made an on-the-spot study of cobalt losses in Northern Rhodesia and Belgian Congo, investigated an electrolytic titanium process in which the Air Force is interested, and began an intensive study of new processes particularly applicable to hydrometallurgy of complex ores.

Ferrous metals and alloys.—The Bureau continued its aggressive search for domestic sources of manganese during the year, examining many areas in various parts of the Nation. Drilling investigations were made to ascertain the extent and character of manganiferous reserves of the Cuyuna range in Minnesota and manganiferous breccia of northeastern Tennessee.

Metallurgical research on manganese progressed with further electric smelting tests on rhodonite and other highly siliceous materials of the Pacific Northwest. Experiments indicated that pig irons of any desired manganese content can be made from low-grade materials. Various metallurgical processes were applied to ores from the Cuyuna range and from Artillery Peak, Ariz., and the Bureau achieved satisfactory extraction of manganese from several Maine ores.

As part of its responsibility for developing more economical and efficient ways of using low-grade domestic iron ores, the Bureau conducted taconite smelting tests in its experimental blast furnace at Pittsburgh, Pa. Seeking improved techniques for making steel, it also studied the addition of materials to an open-hearth furnace by lance injection and investigated effects of various elements on the hot-working characteristics of steel. The Bureau's research laboratory near Redding, Calif., was closed during the year, and its functions were transferred to Pittsburgh. This consolidation will reduce costs and make possible more rapid progress in iron and steel research.

Low-carbon chrome silicide made by the Bureau from offgrade domestic chrome ores was tested by private firms during the year and found satisfactory for use in steelmaking. In cooperation with industry, the Bureau devised a method for producing low-carbon ferrochromium free of contaminants. Also, it produced high-purity chromium metal directly from a refined chromium-chemical electrolyte rather than from electrolytic metal by hydrogen reduction.

Efforts to achieve partial self-sufficiency in strategic nickel paid off during the year with completion by the Bureau of an extensive drilling investigations in deposits of lateritic ore in the vicinity of Nicaro, Cuba. The project, conducted under an agreement with the General Services Administration, indicated more than 34 million tons of ore averaging 1.39 percent nickel, 0.10 percent cobalt, and 35.8 percent iron. As a result, it was decided to expand by 75 percent the capacity of a Government-owned nickel-processing plant at Nicaro. Bureau metallurgists now are trying to develop methods of recovering the cobalt and iron lost in extracting the nickel. Success would make the Nicaro deposit one of the world's major iron-ore sources.

Other developments in the Bureau's nickel research included continuous direct-smelting tests on low-grade nickeliferous ore from the Red Flats deposit near Gold Beach, Curry County, Oreg., and publication of results of continuous selective reduction tests on ores from Brazil, Riddle, Oreg., and Cle Elum, Wash.

Base metals.—To conserve copper resources, the Bureau cooperated with industry in seeking mining methods that will increase ore recovery from the White Pine deposit in Ontonagon County, Mich., one of the world's largest copper reserves. Also in cooperation with industry, it began a study of the mechanics of undercut block caving in the large, low-grade copper deposit at San Manuel, Ariz.

Research on lead and zinc was emphasized. Extensive field tests, made in cooperation with the Geological Survey in the northwestern part of the Tri-State district, showed that costs may be reduced by substituting geophysical methods for churn drilling in the preliminary stages of some zinc-lead exploration projects. The Bureau continued to maintain the Leadville drainage tunnel, which saw little use during the year because of depressed conditions in the lead- and zinc-mining industries.

Research to improve zinc die-casting alloys so they can compete more effectively with other materials showed that maximum strength is obtained with 2 to 5 percent manganese; ductility is best at the lower end of this range. Further studies will deal with effects of lithium, copper, aluminum, and beryllium.

Research on recovering cadmium and germanium as byproducts of zinc smelting resulted in high extraction of the combined metals by fuming from zinc concentrates. However, separation of the metals requires further study.

Encouraging developments in long-term investigations of methods for recovering nonferrous metals from scrap included successful molten-centrifugation tests on zinc containing iron and lead and on intermediate tin-smelter products high in iron, arsenic, and antimony. High-purity zinc was recovered experimentally from galvanizer's dross by electrolysis.

Rare and precious metals.—In its search for deposits of fissionable elements for the Atomic Energy Commission the Bureau drilled and sampled more than 30 prospects and examined more than 100 others for possible future investigation. Commercial quantities of uranium and thorium minerals were indicated in several deposits.

Metallurgical research directly related to the exploratory program developed special techniques for analyzing radioactive ore samples. Encouraging progress also was made in studies to develop new methods for producing tantalum-columbium, uranium, and rare-earth metals in relatively pure form.

Under a contract with the AEC, the Bureau analyzed and evaluated more than 11,000 samples of ore believed to contain fissionable elements.

Increased domestic production of strategic beryllium is promised by the Bureau's development of methods for recovering beryl from ores mined in South Dakota's Black Hills and at King's Mountain, N. C. Columbium and tantalum, both of which have important defense applications, were recovered experimentally from tin slags and titanium and bauxite ores.

Using Bureau-developed processes, industry began producing zirconium and hafnium during the year. Initial output was small, however, and the Bureau's Northwest Electrodevelopment Laboratory at Albany, Oreg., remained the principal source of these metals required by the Atomic Energy Commission.

A critical shortage of selenium, used extensively in the electronic. chemical, and metallurgical industries. spurred the Bureau's search for means of recovering the element from large, low-grade deposits.

Light metals.—Demonstration-scale operation of the Laramie, Wyo., alumina plant was terminated in March 1954, ending one phase of an extended program aimed at recovering alumina from domestic materials other than bauxite. In 15 operational runs the Bureau produced about 800 tons of alumina from anorthosite rock and obtained technical and cost data that will serve as a basis for estimating the value of other materials as potential sources of alumina. Although costs were such that the product cannot compete with alumina from bauxite at current prices, the technical feasibility of the process was demonstrated and the bulk of the plant's output was sold to industry.

Other valuable operating information was collected during the year as a result of successful tests on producing and refining aluminum-silicon alloys from clay in an electric furnace. In cooperation with the Geological Survey, the Bureau finished a comprehensive report on the bauxite industry, which the Office of Defense Mobilization is to publish under the title, "Materials Survey—Bauxite."

Fiscal year 1954 saw completion of an important phase of research on developing improved structural properties in magnesium-lithium-aluminum alloys, considered the lightest and most ductile of the magnesium-base alloys. By adding to the store of basic information on magnesium and improving the technology of its alloys, the Bureau hopes to hasten the time when this versatile metal can take its place as a major structural material.

Under a contract with the General Services Administration's Emergency Procurement Service, the Bureau's pilot plant at Boulder City, Nev., is producing titanium sponge metal to supplement insufficient commercial production. From July 1953 to May 1954 the Bureau made 389,256 pounds of metal under this contract, which will expire in October 1954.

Research on the extractive and physical metallurgy of titanium moved ahead during the year. Besides devising a method for making titanium mixtures that can be treated by electrolysis to produce high-purity metal, the Bureau studied fabricating, alloying, and heat-treating techniques. Other research involved production of titanium tetrachloride from ilmenite and other titaniferous materials; chemical and galvanic corrosion of the metal and its alloys and welds; and methods for electroplating titanium onto other metals.

Ceramic and fertilizer materials.—In cooperation with industry, the Bureau completed large-scale pilot-plant tests, producing good-quality synthetic mica that can be used in commercial manufacture of glass-bonded mica products. It also helped to evaluate synthetic mica as a bond for abrasive wheels and conducted research to improve the strength and flexibility of reconstituted mica sheet. A new ceramic dielectric, phosphate-bonded synthetic mica, was developed.

Reconstituted block talc, developed by the Bureau, was tested by industry in vacuum power tubes to determine its behavior as a high-frequency insulator material. Bureau laboratory tests indicated that hot-pressed synthetic mica and phosphate-bonded synthetic mica are promising substitutes for natural block talc.

During the year the Bureau acted as an engineering consultant to the General Services Administration in the experimental operation of a Government-owned graphite mine and mill at Chester Springs, Pa. Results of the operation showed that graphite suitable for manufacturing crucibles can be produced, although at high cost.

A mining machine, patterned after one used in mining coal, was designed by the Bureau to meet conditions in underground mining of phosphate rock. During experimental mining in cooperation with industry, various types of cutting heads and plows, and different lengths of steel and methods of crowding the face were employed in attempts to cut up the dip in a selected stope. Research also continued during the year on beneficiation of low-grade phosphate rock from Idaho, Wyoming, and Utah.

Pilot-plant studies were undertaken to recover kyanite-sillimanite concentrates from mill tailings produced at Florida ilmenite-monazite operations.

Production, resources, and markets for ceramic materials of the Pacific Northwest were surveyed during the year, and a report is being prepared. Ceramic properties of selected refractory-clay samples from core drilling in Idaho were evaluated.

Field investigations were begun in Colorado to develop sources of refractory clays now in short supply and vital to metallurgical and other industries in the area.

Construction and chemical materials.—As supplies of fluorspar from foreign sources increased, the Bureau began to reevaluate this commodity's domestic position, reviewing current and potential supplies and conducting tests to improve methods of recovering fluorspar from some of its more complex ores. Research continued on recovering fluorine from waste gases evolved in phosphate-rock processing and converting it into synthetic cryolite or other commercial fluorine compounds. Several fluorspar prospects and occurrences were examined, and a drilling project in the fluorspar district of Kentucky was completed.

To reduce United States dependence upon imported industrial diamonds, the Bureau conducted research on the preparation and properties of comparable synthetic materials, such as carbides, silicides, borides, and nitrides, to determine their suitability as substitutes.

The Bureau examined several domestic asbestos deposits, most of them in California and Maine, and continued research on beneficiating high-iron chrysotile for nonferrous uses. Progress was made in improving the quality of synthetic asbestiform compounds, and synthetic asbestos fibers made by the Bureau were submitted to industry for testing. A comprehensive report on major phases of the asbestos industry throughout the world was almost completed, and one describing asbestos deposits of Arizona had been compiled.

Field investigations and laboratory testing of mineral construction materials continued to provide information vital to the development and defense of Alaska.

The Bureau continued its comprehensive survey of domestic sulfur resources, examining deposits and preparing reports on several areas.

Miscellaneous research on minerals.—In its efforts to apply physical theory to mining problems, the Bureau used equipment developed in its laboratories for microseismic recording and borehole surveying in studying design, control, and behavior of underground mine openings in Michigan, Arizona, Ohio, Missouri, and Colorado. To provide more complete instrumentation, construction was begun on a camera that can be used to photograph the inside of a borehole.

Blasting research indicated that damage produced at a free surface by an explosion in rock can be predicted from only a knowledge of the weight and depth of the charge and a general classification of the rock.

Researchers now are seeking a simple way to predict the volume of rock that will be broken by an explosion in a given rock type. In supplemental studies the Bureau determined physical properties of 19 major rock types and continued to investigate the interrelationship of certain properties.

Encouraging results were obtained during the year in attempts to develop a diamond-drilling technique in which the normal flow of drilling fluid is reserved to increase drilling speed and core recovery. Work continued on a manual for the Corps of Engineers on design of underground installations in rock.

The Bureau continued to measure and correlate thermodynamic properties of metals, nonmetallic minerals, and inorganic chemical compounds, furnishing valuable information to industry and to other research organizations for the formulation and evaluation of chemical and metallurgical processes.

Research on applying ultrasonics—the science of sound waves at frequencies above the limit of human hearing—to mineral-dressing problems revealed that ultrasonic irradiation can reduce twentyfold the mechanical-agitation time required to condition mineral surfaces for flotation.

The Bureau further developed the fluorescent X-ray spectrograph into a routine production tool that provides rapid, easier, and cheaper analyses of many elements on large numbers of samples; provided technical advisory and consulting services for the Department of the Interior's saline-water-conversion program; and began a preliminary study of the possibility of extracting minerals from sea water.

RIVER-BASIN ACTIVITIES

Cooperation with other Federal and State agencies in the Department's long-range program for wise development and use of all resources in the several river basins of the United States continued during the year. Since the success or failure of a mineral industry often depends upon availability and cost of water and power, the Bureau conducts thorough investigations to make sure that mineral potential is given proper consideration in planning development of water and power resources in these areas.

Arkansas-White-Red River Basins.—Surveys of mineral-industry and resource potential continued in the 8-State basin area, involving more than 40 minerals now produced commercially. A long-range program for mineral investigations and research was prepared and approved by the Interagency Committee. Reconnaissance examinations and reports of 140 newly proposed reservoir sites and 35 previously authorized projects were made for construction agencies. Statements were prepared showing the effect on mineral industries of some 270 proposed dams and reservoirs. Several sites involved cement plants, large producing oil and gas fields, or deposits of coal or other important minerals. To achieve coordination among cooperating agencies, Bureau engineers reviewed 370 reports submitted by others. Four special detailed subbasin mineral-inventory reports were made to the committee, and others are nearly complete.

Missouri River Basin.—Nine preliminary reports were prepared and distributed to cooperating agencies during the year. They described mineral resources and mineral industries that may be affected by water-development projects. Included was information on minerals and metals in the fire-clay districts of Missouri, the Black Hills of South Dakota, and the Sun-Teton Division in Montana; manufacture of ammonia and lightweight aggregates in North and South Dakota; mineral production for the basin, 1910–50; and applied physics studies at dam sites. Area studies were begun on minerals and metals in the Powder Division, Montana, and the northern coal district of Missouri; oil and natural gas in the Cheyenne Division, Wyoming, and the Williston Basin, Wyoming and North Dakota. Studies were under way on storing, carbonizing, drying, and pelletizing lignite; minerals- and metals-utilization studies progressed on chromite, cement, phosphate, aluminum, titaniferous magnetite, limestone, gypsum, and lightweight aggregates.

New England-New York Survey.—Mineral-industry and resources studies are being continued in the six New England States and New York. Thirty-two mineral-commodity reports were prepared, and 28 river-basin reports were written in cooperation with the Geological Survey. Field investigations were made of deposits of lead and zinc, asbestos, emery, coal, peat, slate, granite, limestone, talc, anorthosite, and pegmatite minerals.

Problems of mineral-industry waste were studied at 597 plants by Bureau engineers who took complete inventories of water-borne mineral wastes at 369 of them. Technical assistance on waste problems was given at 22 plants. A paper, Regeneration of Spent Pickle Liquor, was published.

Other River Basins.—Investigations related to the use of water and power in developing resources are also under way in several other areas of the United States and in Alaska.

SAFETY AND HEALTH ACTIVITIES

For more than 44 years the Bureau of Mines has conducted intensive programs of research, investigation, and training to promote safe and healthful working conditions in the mineral industries. In 1941 Bureau personnel were authorized for the first time to inspect individual coal mines, and in 1952 they were directed by the Congress to enforce regulations for preventing major disasters in the Nation's larger coal mines. Although it regards these more recently assumed responsibilities as important and necessary, the Bureau does not consider them a cure-all for health and safety problems. It continues to rely heavily on research and investigation to identify hazards and develop ways of eliminating them and on training individual workers and supervisors to spread the knowledge gained throughout the mineral industries.

Work on primary hazards.—The Bureau continued its fight against falls of roof and coal and haulage accidents, which together caused nearly 83 percent of all fatalities and 45 percent of all injuries in coal mines during 1953. Conducted in cooperation with State and industrial officials, the campaign against these hazards includes research, investigation, education, and promotion of better roof-control and haulage practices.

The outstanding development in the Bureau's roof-control program has been the adoption of roof bolts as a substitute for wooden timbers. This method has been found so effective and economical that the Bureau has recommended its use wherever feasible, and at the end of the fiscal year 580 coal and 150 noncoal mines were using them.

During 1948, when the Bureau first sponsored roof bolting in coal mines, the roof-fall fatality rate was 0.62 per million man-hours of exposure. This figure was reduced to 0.44 in 1952 but increased again to 0.51 in 1953, when unsettled conditions in the industry made proper maintainance difficult.

Bureau employees in the field held scores of conferences on roof control during the year with mining-company officials and inspectors of State mining departments. They made regular surveys of roof-bolt installations in all districts, submitting reports to operators, State inspectors, and Bureau headquarters in Washington. The Bureau also conducted cooperative tests, in both anthracite and bituminous-coal mines, of various other types of roof supports, including yielding props, steel props, concrete and wooden sets, and extensible canopies.

Progress in the Bureau's program to reduce haulage accidents has been steady. A special section, established in 1950 to study causes of these accidents and ways of preventing them, presents its findings to industry through published reports and motion pictures. Two recent films, photographed underground, were in demand for showing at local and national safety meetings. They depicted hazardous and prescribed practces in shuttle-car operations and in the use of track haulage equipment.

The number of fatal haulage accidents in both bituminous-coal and anthracite mines has been substantially lowered as a result of this campaign. Bureau figures for 1953 show that haulage fatality rates per million man-hours of exposure were reduced more than 22 percent from the 1952 total.

Tests of equipment.—Inspection and testing of electrically operated mine equipment resulted in approval of 67 complete units of various types as permissible for safe use in coal mines. Cooperating with the Pennsylvania Department of Mines, the Bureau made 42 flame tests on electrical trailing cables offered by manufacturers for use with face equipment. Studies were made to develop portable equipment for sampling exhaust gases from diesel engines, and work was done on several types of conditioners for these engines.

During the year special studies were continued for the Navy on electrical fire and explosion hazards on vessels and in aircraft.

Health.—The Bureau continued to study conditions affecting the health of workers in the mineral industries. It supplied information on mine ventilation and determination and control of harmful gases and dusts and tested respiratory protective devices.

More than 15,800 samples of coal-mine air and 500 atmospheric samples from other industrial sources were analyzed during the year. Most of the samples were collected during coal-mine inspections, but more than 100 came from sealed fire areas in coal mines. Several were taken from metal and nonmetallic mineral mines. One new approval and 46 extensions of approval were granted on respiratory protective devices during the year.

Laboratory studies were continued for the Bureau of Ships on the nature and quantity of toxic gases produced by thermal decomposition of plastics. Two reports on this work were completed during the year. Similar studies were prepared under a contract with the Westinghouse Electric Corp., and a report was submitted.

An investigation showed that employees in a coal-cleaning plant were being exposed for brief periods to unsafe concentrations of carbon tetrachloride vapors from float-and-sink testing. After substituting tetrachlorethylene for the carbon tetrachloride, the plant management requested additional Bureau tests, which indicated that harmful exposures were negligible. Other studies concerned irrespirable atmospheres in manholes, gas leakage into basements, flammable vapors from roof coatings, performance of a calorimetric carbon monoxide indicator in the presence of oxides of nitrogen, and use of infrared spectrometry to determine explosive gas in mine-air samples.

Cooperating with the Signal Corps, the Bureau made 158 spectrographic analyses to complete its part of a study of coal and coal ash as sources of rare elements. Chemical, spectrographic, petrographic, and X-ray diffraction examinations were completed on representative samples of perlite to determine possible health hazards in handling and processing it.

Late in the year development of a second experimental coal mine was begun at Bruceton, Pa. This will be used exclusively for dust studies, which cannot be conducted in the existing mine because of conditions created by other experiments in progress there. A survey of dust-control practices in the coal-mining industry was initiated during the year, and literature on the prevention and suppression of dust in mining, tunneling, and quarrying was assembled and summarized for transmittal to the International Labor Office, Geneva, Switzerland.

Work continued on development of apparatus and techniques for testing respirators used in spray painting. Also, tests were made to determine the concentrations of carbon dioxide produced on rebreathing in a full-facepiece-type respiratory inlet covering, which is being considered for use with self-contained breathing apparatus in mine rescue work.

Complete surveys were made of ventilation systems in 2 coal mines and partial surveys were made in 2 others in connection with coal-mine inspection problems. A study was conducted in another coal mine to determine the effect of barometric-pressure changes on explosive-gas emission from caved areas.

A nonlinear electric analog for semiautomatic analysis of mine-ventilation-network problems, received and installed during the year, was tested and studied. This instrument will permit solution of ventilation problems that are almost prohibitively complex when approached by conventional methods.

Accident analysis.—With collection of accident statistics progressing smoothly on a regional basis, the Bureau's Washington staff continued to concentrate on assembling statistical material to meet a steadily rising demand for information on injury and employment experience in the mineral industries.

Fatality and overall injury experience at the Nation's coal mines was reported regularly during the year, and accident statistics for metal and nonmetal mines, stone quarries, and metallurgical plants were brought up to date. At the end of the year, bulletins showing the safety record of coal mines in 1950 and 1951 had been completed, the 1952 bulletin was nearly ready, and work on the 1953 publication was well under way. Statistics were compiled and tabulated for inclusion in revised versions of the Bureau's coal- and metal-mine accident-prevention courses.

The 29th National Safety Competition and the 4th National Sand and Gravel Safety Competition were conducted during the year, and cooperation was given on safety contests sponsored by the National Slag Association, National Lime Association, National Sand and

Gravel Association, and National Crushed Stone Association. A record total of 1,110 plants competed in the various contests.

Safety training.—Bureau employees carried out an intensive program of safety education and training which, for more than 44 years, has proved effective in reducing the toll in lives and property claimed by accidents in the mineral industries.

During the year nearly 17,000 men completed a 20-hour coal-mine accident-prevention course for miners, making a total of 96,659 trained since the Bureau inaugurated the course in 1947. More than 19,000 supervisors and aspirants for supervisory positions have completed a similar course which requires 40 hours of attendance. An accident-prevention course for metal miners was completed by 372 persons during the year, and 134 workers in the petroleum industry were given safety training by the Bureau. Safety inspections of nearly all major mills, smelters, and refineries in the United States were made to gather material for a new course the Bureau is preparing.

A total of 37,971 employees in the mineral industries were trained in first-aid and mine rescue procedures, bringing the number trained since the Bureau's establishment in 1910 to nearly 2 million. With the training of 527 new instructors, 20,269 persons throughout the Nation now are qualified to teach the Bureau's first-aid course. During the year 115 mines and plants were awarded certificates showing that 100 percent of their employees had been trained in first aid.

Bureau personnel assisted in 38 first-aid and mine rescue contests in 11 States in which 572 teams participated before audiences totaling nearly 53,000. Explosion hazards of mineral substances and flammability of gasoline vapors were demonstrated before groups estimated at more than 66,000 persons. Bureau safety films showing safe operating methods in coal and noncoal mines and on oil-well drilling equipment and first-aid training methods were seen by 33,798 persons at 699 showings.

Representatives from various Bureau field offices received intensive training at Washington headquarters to prepare them for establishing new Holmes Safety Association chapters and councils throughout the Nation's coal-mining areas. Unsettled conditions in the industry increase the need for expanding the activities of the association, which was established in 1926 to foster closer coordination and cooperation in promoting health and safety in the mineral industries.

Investigative work.—During the year the Bureau prepared reports on 31 mine explosions, 36 mine fires, and many of the 368 miscellaneous accidents, including roof falls, premature explosions, explosions in buildings, asphyxiations, and other mishaps which resulted in 372 deaths and 217 injuries. Three of these were major disasters—single accidents causing 5 or more fatalities. One at a gilsonite mine killed

8 men and injured 3, one at an open-pit copper mine killed 5, and one at a chemical plant killed 10 and injured 27. Bureau employees investigated all mine fires and explosions to determine primary causes, probable origin, and contributing factors. Reports of these and other accidents were prepared, recommending ways to prevent their recurrence.

Bureau representatives cooperated with State officials in studies of atmospheric conditions at noncoal mines using diesel equipment. At the end of the year assistance had been given at 79 mines in 25 States where diesel trucks, loaders, bulldozers, drill jumbos, or locomotives are used.

Anthracite flood prevention.—A study was completed of surface-water infiltration and its relation to pumping loads in the southern field of the Pennsylvania anthracite region. Extensive field tests were made to determine what metals or alloys would best resist the corrosive effect of acid mine water if used as construction materials for large emergency pumping plants. The tests were completed during the year, and results are being analyzed.

A report was prepared, giving detailed estimates for constructing a single section of the proposed Conowingo-to-Scranton drainage tunnel. The section would provide temporary relief for the Lackawanna Basin until the entire project could be completed. Similar reports are being prepared for sections of the proposed tunnel in the Western Middle and Southern fields and in the Wyoming Basin.

Substantial progress was made in collecting information on the outlook for the anthracite industry. This will be included as background material in a report on the Bureau's study of the anthracite mine-water problem.

Coal-mine inspection.—During the fiscal year 1954 the Bureau of Mines completed 24 months of operation under the Federal Coal Mine Safety Act, which became law in July 1952. The act consists of title I, the Federal Coal-Mine Inspection Act of 1941 slightly revised, and title II, which contains mandatory provisions designed to prevent major disasters in coal mines regularly employing 15 men or more underground.

During the year, 4,010 regular inspections of title II mines were made, 73 of them jointly by State and Federal inspectors. In addition, 3,018 special inspections were made to determine whether previously cited violations had been corrected. Inspectors observed 8,489 violations under title II, many of which were corrected immediately. They issued 3,297 original notices setting a reasonable time for abating dangers, 882 notices granting time extensions, and 3,301 notices certifying that dangers had been eliminated.

During the year 159 orders requiring withdrawal of men were issued at 93 mines, 51 orders at 39 mines under the act's imminent-danger clause, and 108 orders at 54 mines for failure to abate violations within a reasonable time. In addition, 25 orders were issued, classing as gassy mines that had previously been considered nongassy.

Industry's cooperation with the Bureau under the act is evidenced by the fact that at the end of 24 months of enforcement only 5 applications for annulment of gassy-classification orders had been made to the Director. One request was granted; the others were denied. Two of the Director's denial decisions were appealed to the Federal Coal-Mine Safety Board of Review, which upheld one and reversed the other. One appeal of a gassy-classification order, made directly to the Board, was denied. The Board received two appeals of withdrawal orders. One of these, which could not be appealed to the Director because it was issued under a State-participation plan, was annulled after the Board found that the dangers had been eliminated. The other was revised to permit time for training men to make required tests for explosive gas. At the request of the operator, the Bureau conducted the training, after which the violation was abated and the order was annulled.

At the end of the year the Bureau's coal-mine-inspection force included 254 coal-mine inspectors, 32 engineers, and 8 electrical inspectors, and supporting personnel. This includes additional employees authorized by Congress in 1952, all of whom have completed training and are engaged in inspection work.

Besides carrying out the enforcement duties imposed by title II of the act, the Bureau made 5,311 inspections of title I mines, including 375 strip mines, making recommendations for voluntary correction of observed hazards.

A revised Federal Mine Safety Code for Bituminous-Coal and Lignite Mines of the United States was issued during the year, after consultations with representatives of labor and management in the industry. Safety standards for anthracite mines also were revised and issued as the Federal Mine Safety Code for Anthracite Mines of the United States.

Control of fires in inactive coal deposits.—Since 1949 the Bureau has undertaken control of 41 fires in coal deposits not being mined. Twenty-three of these projects are on the public domain in Colorado, New Mexico, and Wyoming, and 18 are on private property in Pennsylvania, West Virginia, and California. So far, more than 200 million tons of bituminous coal and anthracite, estimated to be worth about $975,000,000 at current market prices, has been saved at a cost to the Government of less than 1 cent a ton.

The Bureau has a record of 130 additional fires in 9 States. On the basis of preliminary examinations, it estimates that if they are not controlled they eventually will destroy 300 million tons of coal, besides causing extensive damage to surface property and endangering lives. Surveys have been made of the most serious fires preparatory to controlling them as funds permit.

MINERAL ECONOMICS

The Bureau continued its long-range analysis of economic factors affecting the mineral industries and collected and published statistics on minerals.

A study was begun of conditions which had resulted in reductions in domestic lead and zinc mine output. Among factors investigated were long-term domestic and foreign market trends, imports, domestic and foreign production of primary and secondary metals, and relations of production and consumption to prices and national economic activity. The Bureau evaluated proposed assistance programs, estimating their cost to taxpayers and their potential benefits to various segments of the mining industry. A technique for economic analysis of distressed mining industries, developed during these studies, now is being applied to other critical-minerals problems, including coal and mercury.

Imports were studied, and various proposals for United States Government action relating to international trade in minerals were analyzed and evaluated. Special studies were made of direct and indirect mineral exports of the United States. In addition, the Bureau cooperated with other organizations analyzing foreign trade in minerals, worked with several groups of the Trade Agreements Committee, supplied material to the Commission on Foreign Economic Policy, and prepared analyses for the President's Cabinet Committee on Minerals Policy.

Research on taxation concerned mostly technical items, some of which were mentioned in the Internal Revenue Code of 1954 (H. R. 8300). Treatment of expenditures in various stages of the development of mineral properties, interrelations of percentage depletion and loss carryover, and estimation of the possible impact of various levels of percentage depletion are typical examples of this work. As an outgrowth of assignments for the President's Cabinet Committee on Minerals Policy, the Bureau examined many tax proposals with the Treasury Department and arranged to cooperate with that Department in a review of minerals taxation which had been scheduled in accordance with the President's budget message of 1954.

At the request of the President's Council of Economic Advisors, commodity surveys were made of the relationship of the minerals industries to national economic growth. This study was designed to review potential bootlenecks in future expansion and to provide a background for formulating policy and making further inquiries.

The Bureau remained active in the Federal interindustry research program on a sharply reduced scale. Reports were completed on mobilization requirements for strategic and critical materials, including molybdenum, tungsten, refractory and metallurgical grades of chromite, mica splittings, and nickel. The Bureau also estimated requirements of equipment and other capital investments for expanding mining, beneficiation, and further processing of coal, iron, copper, nickel, magnesium, zinc, aluminum, fluorspar, and other nonferrous minerals and metals.

A major review of the Bureau's statistical canvassing program was undertaken. Commodity surveys were discussed at meetings with industry, detailed descriptions and justifications were prepared for all surveys sent to the Bureau of the Budget for clearance, and, where feasible, scientific sampling was used more often than previously. The Bureau also continued to collect special mineral-commodity facts required by various defense agencies.

Responsibilitly for conducting the Bureau's mineral-extraction surveys, other than fuels, was delegated to the regions, which negotiated new contracts for cooperative statistical canvasses with State agencies.

The Bureau decided to publish future editions of the Minerals Yearbook in three volumes—volume I, Metals and Minerals Other Than Fuels; volume II, Mineral Fuels; and volume III, Geographic Chapters.

FOREIGN ACTIVITIES

Highlighting the Bureau's foreign-minerals activities during the year were extensive fact-finding and analysis service given to the Special Subcommittee on Minerals, Materials, and Fuels Economics of the Senate Committee on Interior and Insular Affairs and active participation in the Government's foreign technical-assistance program.

Fact-finding and analysis.—Through its various publications and through correspondence and interviews, the Bureau supplies industry, other Government agencies, and the public with information on foreign developments that influence world markets for minerals. In conducting this service, the Bureau maintains liaison with mineral attachés and other reporting officers of the Foreign Service of the Department of State.

During the year the Bureau assisted a special subcommittee of the Senate in an inquiry to determine accessibility of strategic and critical raw materials to the United States in time of war. Because this Nation receives a large part of its mineral supply from foreign areas, facts regarding resources, technology, and production abroad and international trade were highly pertinent to the committee's study.

Technical assistance.—The Bureau continued to cooperate with foreign-aid agencies by making available its laboratory and staff in support of technical-assistance programs for underdeveloped countries. Consolidation of all foreign economic activities into the Foreign Operations Administration early in the year caused some readjustment of plans. All programs were reviewed in the light of newly established policies, and considerable time was spent in working out a cooperative arrangement under which the Bureau could function effectively in stimulating wiser use of mineral resources in those areas of the world receiving United States help. Although final agreements were not reached until late in the fiscal year, the Bureau conducted 11 foreign-assistance programs and completed preliminary work on 2 additional projects:

The Bureau's team in Afghanistan was enlarged to emphasize production of minerals other than coal, such as beryl and an unusually high grade chromite. In Brazil—the largest source in the Americas of industrial diamonds—special attention was given to improving recovery of this highly strategic commodity. In Colombia, India, and the Philippine Islands the Bureau was occupied chiefly with coal problems, while aid to Pakistan consisted of advisory services to the Government on the purchase of coal-gasification and other equipment for use in a fertilizer plant now under construction there.

The Bureau has been helping Israel to evaluate the commercial possibilities of its mineral resources and to establish an ore-dressing laboratory; also tests have been conducted in the Bureau's laboratories on Israel's known deposits of phosphate rock and copper. Under Bureau guidance, Nepal is organizing Government services to foster development of its mineral resources. Cooperating with the Mexican Government, a Bureau team developed a mobile ore-testing laboratory to help small mine operators improve metallurgical efficiencies.

Work in Cuba shifted during the year from training Government engineers in commercial appraisal of mineral deposits to assistance in establishing an ore-dressing and analytical laboratory. The Bureau made progress in its own laboratories in developing a method for separating copper from manganese ores in an effort to help the Hashemite Kingdom of Jordan exploit its manganese deposits.

Early in fiscal year 1955 a mineral adviser is scheduled to go to Liberia to assist in formulating a mining code designed to encourage foreign capital to invest in development of that country's mineral resources. An ore-dressing expert will be assigned to Peru to help the Government expand and improve its metallurgical laboratories and increase recoveries in several of its custom mills.

Training of foreign technicians continued, a total of 20 from 11 different countries having worked in Bureau laboratories or received other Bureau training during the fiscal year. Of these, 6 were awarded the Bureau's Certificate of Merit for successfully completing 6 months or more inservice training. The others were still on duty at the close of the year or had received only short periods of training.

PUBLIC REPORTS

The Bureau of Mines, as directed by its organic act, reports results of its research and investigations in its own publications and in contributions to the scientific and technical press. Manuscripts of such reports, approved and edited during the fiscal year, totaled 587.

Printed publications totaled 167, including 11 bulletins, 130 Minerals Yearbook chapters and 2 bound volumes with extensive indexes, 6 miners' safety circulars, 4 handbooks, and 14 miscellaneous items. Processed reports totaled 164, including 77 reports of investigations, 30 information circulars, 12 Mineral Trade Notes, and 45 miscellaneous items. Articles for the technical press totaled 256. In all, more than 37,000 pages of manuscript were edited and about 2,000 technical illustrations prepared for printing or processing.

Several new records were established by the Bureau in its informational motion-picture program. Showings of industry-sponsored films dedicated to conservation and efficient use of mineral resources reached a new high of 214,698. The number of cooperating distributing centers in leading audiovisual libraries at schools, colleges, and State educational agencies increased to a record 180.

New film subjects dealing with utilization of minerals were added to bring the total number of titles circulated to 63 and the total number of prints to approximately 6,200.

These noncommercial films were used more widely in teaching such subjects as conservation, economic geography, manual arts, and chemistry. More than 30 million people are estimated to have seen the Bureau's films during the year, either at group showings or on noncommercial television programs.

ADMINISTRATION SUMMARY

Completion of many additions to the Bureau of Mines Manual, a reduction in the number of motor vehicles, advancements in the incentive awards program and employee safety program, and savings of approximately $2,500,000 in personnel costs were among the many attainments of administrative offices of the Bureau during the fiscal year 1954.

Several parts of the Manual were issued during the year, and preparation of other sections continued at a steady pace.

Thorough property inventories were completed at 58 of the Bureau's 83 field stations and were nearing completion at the remaining 25. The Bureau's motor-vehicle fleet had been reduced by 95 at year's end, an 8-percent drop from the previous year's 1,170, without impairing operating efficiency. Adoption of an excess-property and warehousing program resulted in disposal of $100,000 in property and an additional saving of $2,000 annually in cancellation of warehouse leases.

Further economies resulted from the Bureau's record-management program. Contents of many filing cabinets were destroyed or transferred to the Federal Records Center, making existing cabinets available for further use and reducing the purchase of new filing equipment.

Another significant attainment was the revision of the Bureau's accounting system on a modified cost-finding basis, which enabled the Bureau to determine more accurately the outlay for projects and to provide more efficient utilization of the taxpayer's dollar. Besides these advantages, better relations were established with business concerns and Bureau employees.

As of January 1, 1953, the Bureau had 5,197 full-time employees, but this number was reduced to 4,737 through rigid economies and improved utilization of personnel. Meanwhile, the Incentive Awards Program continued to save tens of thousands of dollars annually and resulted in improved employee relations, greater safety for workers, more healthful surroundings, and better public relations. Employee health and safety programs were guided through the office of the Bureau Safety Engineer. As in the past, the Bureau employed two commonly used statistical standards for measuring achievements in safety endeavors: (1) The frequency rate, or number of occupational injuries per million man-hours, and (2) the severity rate, or days lost per thousand man-hours. Accident-prevention measures are aimed to control the first; obviously, as long as accidental injuries occur, chance will be a factor in determining their severity.

The latest figures showed that for the second consecutive year the Bureau held its accident-frequency rate among employes to 9.28, the lowest in the 8 years of the employee safety program. The severity rate, however, increased to 1.07, chiefly because of the death of one employee and severe injury to another in a chemical laboratory explosion. To prevent recurrence, additional precautionary measures were adopted at this laboratory and similar installations.

TABLE 1.—*Schedule and number of employees*

	GS	CPC	Ungraded	Total
Departmental	593	10		603
Field	3, 032	174	928	4, 134
Total	3, 625	184	928	4, 737

Incentive awards.—Following are some of the attainments under the incentive award program showing increased employee participation and increased savings to the Government:

Number of suggestions received during the year	169
Number of suggestions receiving awards	61
Total suggestions disapproved	99
Total of cash awards granted	$2, 943
Suggestions resulting in estimated annual savings	31
Total of estimated annual savings	$61, 825. 60
Suggestions that resulted in intangible savings	30

Property.—Property records of the Bureau of Mines, as of June 30, 1954, show accounts as follows:

Automotive equipment	$2, 233, 227. 66
Canvas, composition, leather and rubber goods	24, 370. 83
Drafting and precision engineering instruments	125, 017. 93
Electrical equipment	529, 994. 11
Hardware	524, 850. 12
Household furnishings	127, 309. 55
Laboratory apparatus and appliances	7, 966, 870. 65
Medical and surgical appliances	58, 386. 80
Office furniture, appliances, and floor coverings	2, 671, 186. 23
Photographic and projection apparatus	315, 045. 41
Powerplant and general shop equipment	6, 747, 062. 46
Real estate	23, 386, 659. 72
Specialized equipment	773, 790. 42
Total	45, 483, 771. 89

This property is in Washington, D. C., and at the various field stations and offices of the Bureau.

FINANCE

The total funds available to the Bureau of Mines for the fiscal year ended June 30, 1954, including direct appropriations, prior-year balances available, reimbursements, advances, and transfers from other Government agencies, proceeds from helium operations, and contributions to trust funds from non-Government sources, were $38,860,836. Of this amount $32,307,211 was obligated, leaving an unobligated balance of $6,553,625.

Funds available to the Bureau of Mines for fiscal year 1954, by source of funds

Direct appropriations	$22, 713, 180
Prior-year balances available	5, 200, 600
Reimbursements from other Government agencies	441, 144
Advanced or transferred from other Government agencies	7, 176, 355
Proceeds from helium operations	3, 023, 442
Contributions to trust funds from non-Government sources	306, 115
Total, Bureau of Mines	38, 860, 836

Obligations incurred by the Bureau of Mines in the fiscal year 1954, by appropriation

Conservation and development of mineral resources	$15, 280, 954
Health and safety	4, 827, 022
Construction	413, 264
General administrative expenses	1, 174, 278
Construction and rehabilitation, Bureau of Reclamation (transfer to Bureau of Mines)	128, 821
Working funds (includes all consolidated and allocated working funds)	7, 073, 148
Economic and technical assistance, Near East and Africa, executive (transfer to Interior)	80, 948
Administrative expenses, Mutual Security Act, executive (transfer to Interior)	38, 425
Technical assistance, American Republics and non-self-governing territories of the Western Hemisphere, executive (transfer to Interior)	5, 760
Economic and technical assistance, defense support, Asia and Pacific, other than Formosa and the Associated States of Cambodia, Laos, and Vietnam, executive (transfer to Interior)	174, 949
Mutual defense financing, defense support, economic and technical assistance, Europe, executive (transfer to Interior)	3, 353
Mutual defense financing, defense support, economic and technical assistance, Formosa and the Associated States of Cambodia, Laos, Vietnam, executive (transfer to Interior)	6, 694
Development and operation of helium properties	2, 611, 061
Contributed funds	488, 534
Total obligations incurred	32, 307, 211
Unobligated balance, June 30, 1954	6, 553, 625
Total, Bureau of Mines	38, 860, 836

Oil and Gas Division

Hugh A. Stewart, *Acting Director*

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THE Secretary of the Interior, by Official Organization Handbook Release No. 9, of April 26, 1954, reestablished the Oil and Gas Division to take effect on May first.

Under supervision of Assistant Secretary—Mineral Resources, the Oil and Gas Division provides staff assistance on oil and gas matters; obtains coordination in the administration of Federal oil and gas policies; maintains contact with oil and gas industries and with State regulatory bodies; supervises activities of the Federal Petroleum Board in administering the Connally Act; and performs defense mobilization functions with respect to petroleum and gas.

The Division exercises the initiative in obtaining coordination and unification of oil and gas policies and related administrative activities of all Federal agencies. It advises other agencies and enlists their cooperation to assure adequate development, distribution and utilization of petroleum and gas resources and facilities to meet both civilian and military requirements. The Division is responsible for functioning of an Interdepartmental Petroleum Committee and Departmental Petroleum Committee.

The Division carries out petroleum and gas functions and responsibilities authorized by the Defense Production Act of 1950, as amended, and delegated to the Secretary of the Interior by and under Executive Order 10480, as amended, and Office of Defense Mobilization Order 1–7, as amended. The delegated functions are aimed at assuring adequate supplies of petroleum and products for civilian and military requirements. They include (1) assembling and presenting data concerning the supply of, and requirements for petroleum both for the United States and the free world, and similar information pertaining to gas for the United States; (2) recommending goals for expansion of industry capacity for approval by the Office of Defense Mobilization; (3) analyzing and preparing reports and recommendations to Office of Defense Mobilization for approval or denial of applications from industry for accelerated tax amortization, available for defense related facilities under Section 124A of the Internal Revenue Code; (4) advising ODM with respect to use of other special incentives for expansion authorized by the Defense Production Act; (5) directing and coordinating work of the Foreign Petroleum Supply Committee, established under the Voluntary Agreement Relating to Foreign Petroleum Supply; and (6) furnishing information to ODM for programs with respect to petroleum production, refining, transportation, and storage, and the transmission and distribution of gas.

Defense mobilization functions include collaboration with the Department of Defense and ODM on petroleum security plans and participation in related activities under assignments from ODM in connection with its responsibilities under Reorganization Plan No. 3 of 1953.

The Division represents the United States on the North Atlantic Treaty Organization's Petroleum Planning Committee, which carries on studies of defense requirements of all participating countries.

The Division, since its reestablishment on May 1, 1954, has proceeded to aline the organization to discharge its diversified and increased responsibilities and has carried on unfinished business of the Petroleum Administration for Defense, preparing studies and forecasts with respect to wartime requirements for petroleum and products. Of primary importance has been the day-to-day service of the Division in furnishing essential information and advice to other Government agencies.

The petroleum and gas industries continue to use the incentive of accelerated tax amortization, provided under the Internal Revenue laws. In the 2 months of May and June 1954, OGD made reports and recommendations for approval or denial of certificates of necessity on 19 new applications. Many requests for scope amendments on certificates already issued were analyzed and reports made as well as some requests for time extensions.

OGD's Acting Director, designated as representative of the Assistant Secretary—Mineral Resources, provided the leadership in collaborating with the Department of Defense representatives in the formulation of plans for effective functioning as early as possible of the reactivated Military Petroleum Advisory Board in order for Government to avail itself of expert counsel, advice and information on oil and gas matters relating to national security and defense. Within a month after the Board was established, the Assistant Secretary—Mineral Resources called the first meeting on May 25, 1954, at which the Chairman was elected and the basic rules and procedures under which the Board would operate were developed. For the first time the gas industry, which has become a major element in the Nation's energy producing field, will have full representation on the Board through a gas transmission and distribution panel and committees.

The Secretary of the Interior continues to rely on the National Petroleum Council to provide the wisdom and experience of the oil industry on national petroleum matters as requested. Important studies initiated by the Petroleum Administration for Defense are well under way and these are required by the Oil and Gas Division in discharging its duties.

A Gas Industry Advisory Council was available for advice and consultation on problems with respect to gas in discharging responsibilities under the Defense Production Act.

The Foreign Petroleum Supply Committee, in addition to its work on foreign aviation gasoline reports, is actively engaged in the preparation of a major report on commercial deep water foreign petroleum storage and terminal facilities in friendly nations throughout the world. This is the first time that such a study has been undertaken. It will require several more months of work. When the report is finished, it will contain about 3,000 pages.

The Division also supervises the activities of the Federal Petroleum Board in administering the Connally Act. This act prohibits interstate shipment of oil produced in violation of certain State oil and gas conservation laws and orders issued thereunder. The Board acts as the field agency to initiate and conduct investigations, including the holding of hearings, with respect to the production and interstate shipment of such contraband oil with the view of supporting the oil and gas conservation policies of the respective States.

The Federal Petroleum Board, composed of a Chairman and two members, maintains headquarters at Kilgore, Tex. Suboffices are located at Houston and Midland, Tex., and Lafayette, La.

In adopting the Connally Act on February 22, 1935, the declared aims of Congress were (1) to protect interstate and foreign commerce from the diversion and obstruction of, and the burden and harmful effect upon, such commerce caused by the illegal production of oil, which is that produced in excess of legal amounts allowable as fixed under State laws, said illegal production thereby constituting waste of this natural resource, and (2) to encourage conservation of underground reserves of crude oil in the United States. These objectives were to be accomplished by deterring the production of and prohibiting the shipment or transportation in interstate commerce of all petroleum and its products produced in violation of conservation statutes under State laws, by authorizing injunctions in proper cases to restrain violations of the laws, and by instigating punitive action against offenders with consummated violations. Experience prior to and since 1935 has definitely demonstrated that without the aid of the Federal Government, the States could not adequately enforce their conservation statutes in restraining an enormous waste incident to unbridled exploitation of their valuable petroleum deposits.

The conservation of petroleum in the United States is becoming recognized as a problem of increasing importance in its direct relation to the national welfare, both civilian and military. The problems of increasing petroleum reserves, of maintaining an emergency excess productive capacity, and of reduction or elimination of wasteful production practices are receiving more consideration than ever before.

While the Connally Act is applicable wherever State laws limit the rate of production and prescribe conditions for producing and handling of oil, its chief application is in the States of Texas, Louisiana, and New Mexico, whose regulations prescribed under the act are actively enforced by the Board in cooperation with the States. So far as is possible with the limited resources at its command, the Board also enforces the provisions of the act in other oil-producing States, particularly in Arkansas, Kansas, Mississippi, and Oklahoma.

The primary aim of the Federal Petroleum Board is to secure the maximum possible voluntary compliance with the State conservation laws, thereby minimizing the necessity for prosecution of violators under the Connally Act. Continuing inspections and investigations throughout areas where violations are suspected or reported, and prosecution of violators, serve as a deterrent of great impact against the illegal production of oil. Administration of the act is implemented through regulations which require producers, transporters, refiners, and others handling petroleum and its products in the designated area to keep operating records and file periodical reports with the Board. Presently the designated area consists of 106 counties in Texas, Lea and Eddy Counties in New Mexico, and the entire State of Louisiana.

From this designated area the Board currently receives and processes each month approximately 6,700 monthly producers' reports, 535 monthly pipeline reports, and 80 reports from processors and refiners. These reports cover operations in about 2,050 separate oilfields and account for approximately 36 percent of the entire domestic production of crude oil, or 70.3 million barrels each month.

During this fiscal year, some 3,550 leases were inspected, 2,180 leases were actually visited and checked, and 17 pipelines were checked. In the performance of this work 757 oilfields were visited and 1,120 interviews conducted.

During the fiscal year this Board, assisted by 9 examiners and other supporting staff, carried on the operations after the force of examiners was reduced by 5 employees in order to stay within the limits of a budget reduction of 24.7 percent from the previous year. Nineteen cases were on the docket during this year. Of these, 9 cases were closed; 5 of which were closed by prosecution resulting in imposition and payment of $21,425 in fines. At the end of the fiscal year 10 cases were still pending, 3 in an investigative stage, and 7 with the Department of Justice and United States attorneys.

Cooperation between the Division and State regulatory bodies was maintained, through the direct contact of the Board with State conservation agencies and by the Acting Director of the Division in serving as the official representative of the Department of the Interior to the Interstate Oil Compact Commission.

Petroleum Administration for Defense

Joseph A. LaFortune, *Deputy Administrator*

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RESPONSIBILITIES pertaining to petroleum and gas were delegated to the Secretary of the Interior under the Defense Production Act. As Petroleum Administrator for Defense, the Secretary established the Petroleum Administration for Defense to carry out these functions. This Administration was terminated on April 30, 1954.

In the fiscal year activities of the Petroleum Administration for Defense had been fully discharged through the cooperation of the oil and gas industries in supplying top flight personnel.

Controls on all materials, except nickel-bearing steel alloys, ended on June 30, 1953. Allocation of stainless steel was also discontinued at the end of September 1953.

Oilfield machinery and equipment were in ample supply. Therefore, in July, defense mobilization responsibilities for production and distribution of oilfield machinery and equipment which the National Production Authority had delegated by an interagency agreement to the PAD were returned to the NPA.

Well drilling exceeded the record breaking rate of the calendar year 1952. Forty-nine thousand, two hundred and seventy-nine wells were drilled in 1953. It appears that in the calendar year 1954 the number of wells drilled will exceed the previous year's all-time record. Crude oil production was averaging some 6,400,000 barrels a day in 1953.

Refinery construction was progressing satisfactorily. High demand for petroleum products and gas continued. Meeting the military demand for aviation gasoline was still a matter of concern, but with the armistice in Korea it appeared that the enormous demand for aviation gasoline would lessen somewhat.

Construction of oil and gas pipelines continued on schedule and the calendar year 1953 set new records for pipeline construction. About 7,353 miles of principal crude oil and products pipelines were constructed and placed in operation during the calendar year 1953. This pipeline program cost approximately $400 million. In the same period about 21,090 miles of utility gas pipelines were constructed and put in use. In a review of the oil and gas supply position for strategic defense planning, PAD gave special study and attention to the possible need for additional oil pipeline capacity which might be needed in event of a war.

In the last few years natural gas had been recognized for the first time as a vital munition of war and an important fuel in the Nation's domestic economy. The amount of gas marketed in the calendar year 1953 was more than twice that marketed in 1945. Natural-gas utility sales were 53,194 million therms in 1953, as compared to 22,563 million therms in 1945.

REVOCATION OF PAD ORDERS

PAD Order No. 4 set up the minimum quantities of tetraethyl lead that could be included in commercial aviation gasoline. It was placed in effect October 19, 1951, and was necessary to assure meeting the military requirements for aviation gasoline. With marked improvement in the aviation gasoline supply position, the order was rescinded on October 1, 1953.

PAD Order No. 3 was another order designed to increase the output of aviation gasoline. It restricted the use, delivery, and receipt of certain blending agents, such as alkylate, and feed stocks, such as isobutane and butylene, usable in the manufacture of aviation gasoline. A review of the aviation gasoline supply position indicated that avgas production had been built up to a level adequate to meet both military and civilian requirements for the foreseeable future, barring another critical national emergency. But to provide an appropriate period of time for any necessary adjustments by the military as a safeguard for the immediate future, the order was suspended for three months on October 1, 1953. It was terminated on December 1, 1953, at the end of the suspension period.

The revocation of these orders signaled the successful handling of the most troublesome and persistent problem of the PAD's entire history.

All of the 6 orders which the PAD had found it necessary to impose on the oil and gas industries in order to discharge the PAD defense mobilization responsibilities had been lifted. In so doing, the PAD had fulfilled its promise that orders would remain in effect only so long as they were absolutely essential to assure the basic objectives of meeting the military and essential civilian requirements for petroleum and gas during the mobilization period.

FOREIGN PETROLEUM SUPPLY

General improvement in the foreign petroleum supply situation continued throughout the fiscal year. By December 31, 1953, the harmful influence upon world petroleum supply resulting from the shutdown in Iran had been overcome. All restrictions and controls with respect to aviation gasoline were discontinued. Here, during the Korean crisis as in the United States domestic petroleum supply situation, aviation gasoline was the last product to be in a critical supply position.

A change of government in Iran during August 1953 gave more promise that the basic difficulty which resulted in the withdrawal of Iranian oil from world markets might be satisfactorily resolved. Discussions involving the Iranian Government and the Iranian National Oil Co. with a group of British, American, French, and Dutch oil companies with full knowledge of their governments appeared to be making headway toward a solution of the introduction of Iranian oil in the world markets on a sound basis.

PAD had found that the Foreign Petroleum Supply Committee, organized under the Voluntary Agreement Relating to Foreign Petroleum Supply, of May 1, 1953, was the effective source of information required to keep the PAD and other interested Government agencies, particularly the Department of Defense, sufficiently advised on foreign petroleum activities.

It was equally essential that the mechanism of the voluntary agreement be continued for the benefit of PAD's successor organization, the Oil and Gas Division. Accordingly, after the required consultations with the Attorney General and Chairman of the Federal Trade Commission, the Director, Office of Defense Mobilization, on April 15, 1954, approved procedural amendments of the agreement. No alteration of substance was made. Members of the Foreign Petroleum Supply Committee accepted the amendments and the Secretary of the Interior appointed the membership of the Committee. The Committee continued its studies and prepared the foreign aviation gasoline reports.

The PAD completed a survey of the refining capacity in the free-world nations outside the United States. The survey indicated that refining capacity abroad will increase by the end of 1955 to a point 40 percent greater than it was at the end of 1951.

NORTH ATLANTIC TREATY ORGANIZATION

As during 1953, PAD continued to provide the United States representative on the Petroleum Planning Committee of the North Atlantic Treaty Organization, who participated in the work and meetings of the Committee. In addition, the representative was Chairman of the Committee's working group.

ACCELERATED TAX AMORTIZATION AND DEFENSE LOANS

The petroleum and gas industries continued to use the incentive of rapid tax amortization provided by section 124A of the Internal Revenue Code for industry expansion to meet defense mobilization goals. As of April 30, 1954, PAD had received 2,129 applications for accelerated tax amortization for oil and gas expansion projects with a total estimated cost of $5,937,673,000. A total of 1,674 projects costing about $4,305,065,000 had been recommended for approval as of that date. Virtually all recommendations made by the PAD were approved by the Office of Defense Mobilization.

INDUSTRY COOPERATION

In addition to the services of the technical and executive personnel made available to the emergency defense agency, the Secretary of the Interior and Petroleum Administration for Defense utilized the services of hundreds of people in the petroleum and gas industries through the National Petroleum Council, Military Petroleum Advisory Board, Gas Industry Advisory Council, Military Fuels General Advisory Committee, Military Fuels Technical Advisory Committee, and the Foreign Petroleum Supply Committee.

Oil and gas matters relating to national security and defense which had been carried on by the Military Petroleum Advisory Board since March 1947 were performed by the Petroleum Administration for Defense during the existence of that agency. To continue to provide Government, particularly the Departments of the Interior and Defense and the Office of Defense Mobilization, with expert counsel, advice and information on a classified basis concerning matters of petroleum security and defense, it was necessary that an organization be set up for that purpose. To attain that objective the Secretary of the Interior reactivated the Military Petroleum Advisory Board on April 30, 1954, by Order No. 2756. It is composed of 24 outstanding technical experts in the oil and gas industries.

The Military Fuels General Advisory Committee and the Military Fuels Technical Advisory Committee were utilized for obtaining advice on highly technical matters, particularly with respect to refining and the technical problems involved in meeting military fuels specifications.

EMPLOYMENT

The PAD started the fiscal year with 93 employees on its staff. At the end of April 1954, there were 65 employees on the rolls. Of these, 33 were full-time paid employees, 1 executive serving full time without compensation, 2 salaried consultants, and 29 consultants on the without-compensation basis. The Secretary of the Interior approved the transfer of all of these employees to the Oil and Gas Division as of May 1, 1954.

TERMINATION OF THE PAD

The Secretary of the Interior on April 23, 1954, by Order No. 2755, transferred to the Oil and Gas Division certain functions and powers vested in the Secretary of the Interior by delegations or redelegations issued pursuant to the Defense Production Act of 1950. By Official Organization Handbook Release No. 9, of April 26, 1954, the Secretary of the Interior transferred all personnel, funds, and property of the Petroleum Administration for Defense to the Oil and Gas Division, Department of the Interior.

Defense Minerals Exploration Administration

C. O. Mittendorf, *Administrator*

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DURING the fiscal year 1954, the Defense Minerals Exploration Administration vigorously pursued a program, under a delegation from the Office of Defense Mobilization to the Secretary of the Interior, to explore for deposits of strategic and critical minerals and metals in the United States, its Territories and possessions.

Through DMEA the Government furnishes financial assistance on a participating basis to the mining industry for exploration purposes. Specific projects for exploration are established by contract in which the Government participates to the extent of 50 or 75 percent of the cost, depending upon the mineral sought. Funds for the Government's share of the project cost are made available under the borrowing authority provided by the Defense Production Act of 1950, as amended. The amount contributed by the Government to the cost of a project is repayable on a percentage royalty basis from the net sales receipts for any ore produced from the property covered by the exploration contract.

DMEA continued to carry out the exploration program during the fiscal year 1954 with a small Washington staff and five field auditors. Technical field services were provided through the cooperation of the Bureau of Mines and the Geological Survey. Industry participation in the program included individuals, partnerships, and corporate enterprises. The participation of small operators was especially noteworthy.

From the beginning of the program in mid-1951 to June 30, 1954, 2,221 applications for Government aid in exploration have been received from 42 States and Alaska. Requests for aid during the fiscal year 1954 were received for 307 projects. During this year DMEA executed 130 contracts, bringing the total number of contracts executed since the inception of the program to 647. These contracts include exploration projects in 31 States and Alaska. The number of contracts in force at the beginning of the fiscal year stood at 325, climbed to a peak of 344 in October 1953, and dropped to 249 at the end of the fiscal year. Since the beginning of the program a total of 56 contracts have been canceled without any work being done on the projects. Government commitments in contracts executed in the past 12 months have been $4,166,166, bringing the total to date to $19,371,100. Industry participation in the past 12 months has been $2,479,475, and the total to date amounts to $12,446,624.

Eighty certifications of discovery or development of deposits of strategic and critical minerals and metals were issued during the past fiscal year. These 80 certified projects totaled $4,166,658 in contract value. On these projects the Government was committed to participate to the extent of $2,636,003, but only $2,090,108 was actually spent by the Government. Previous to June 30, 1953, 52 projects had been certified. Thus, the total number of projects certified by DMEA as of June 30, 1954, was 132, having a total contract value of $5,794,733. The Government's participation in these projects was set at $3,587,063. Of this amount, the contract cost to the Government was only $2,834,915, due to work on several projects having been completed at less cost than estimated and also due to a number of certified projects still being in operation. As of June 30, 1954, repayments to the Government by operators under DMEA contracts amounted to $323,856. Five operators have repaid in full the amounts of the Government's participation in their projects.

The 132 certified projects covered exploration for antimony, asbestos, beryl, cobalt, copper, corundum, fluorspar, iron, lead, manganese, mercury, mica, monazite, nickel, rutile, sulfur, talc, tungsten, uranium, and zinc. Twenty-three of the certified projects were in North Carolina, 18 in Colorado, 15 in Utah, 11 in Idaho, 10 in Arizona, 7 in South Dakota, 6 each in Montana, Washington, and Wisconsin, 5 in California, 4 in Nevada, 2 each in Arkansas, Georgia, Missouri, New Mexico, and Vermont, and 1 each in Alaska, Florida, Illinois, Iowa, Maine, New Hampshire, New Jersey, South Carolina, Texas, Virginia, and Wyoming. Twenty-one of the one hundred and thirty-two certified projects had not been terminated as of June 30, 1954. On a conservative basis at prices in effect at the end of the fiscal year, the recoverable minerals and metals in the ores found on the 132 certified projects are estimated to have a gross value in excess of $120 million. Substantial ore showings have been disclosed on 68 other projects, which have not advanced sufficiently to furnish information warranting ore estimates but which may eventually be certified.

Work was performed on 121 projects which were terminated without certification of discovery or development during the fiscal year 1954. The estimated cost of these 121 terminated contracts originally totaled $3,096,407, with Government participation set at $2,000,515.

The actual cost to the Government, however, was only $1,193,505. At the beginning of the fiscal year, 112 contracts had been terminated. Thus, since the defense minerals exploration program was instituted, 233 contracts have been terminated without certification. These contracts had an estimated total cost of $5,383,776. The Government's share in the cost of these contracts was estimated at $3,533,790, but only $1,950,557 was expended by the Government. Sufficient ore has been found on some of these 233 terminated projects to warrant their certification, which will follow in due course. A few have found small quantities of ore but not sufficient to justify their certification; however, the termination agreements contain a provision for payment of royalties to the Government if any production is made during a period of 10 years from date of the contract. On the other terminated projects valuable geological information was obtained.

All applications received from operators for financial assistance for exploration are analyzed and studied by technical experts. In the majority of cases, an onsite field examination is made of the proposed project by DMEA field teams comprising personnel of the Bureau of Mines and Geological Survey. Based upon the results of this field work, either a project is approved and a contract made, or the application is denied. A total of 1,008 applications have been denied, 201 during the past fiscal year, and a total of 413 applications have been withdrawn, 85 during the past fiscal year.

The number of applications received during the first 6 months of the fiscal year 1954 declined progressively, but this trend was reversed during the second half of the fiscal year, so that the high monthly rate of applications received in the fiscal year 1953 was approached in the last 3 months. These trends reflected the Government's actions in (1) removing, effective May 15, 1953, 19 minerals from the list of strategic and critical minerals eligible for exploration assistance; (2) eliminating, effective November 3, 1953, further contract arrangements wherein the Government would participate to the extent of 90 percent of the cost of the project, and eliminating 5 additional minerals from those eligible for Government exploration; and (3) restoring, effective March 23, 1954, 19 minerals to the eligibility list.

During the fiscal year 1954, the Contract Administration and Audit Division continued auditing project accounts at a rapid rate. As of June 30, 1954, a total of 475 project audits (covering Government disbursements of $7,186,950) had been made. Of these, 246 audits (covering Government disbursements of $3,518,126) were made during fiscal 1954. The Division has completed audits of approximately 68.8 percent of the exploration program disbursements.

By reason of budgetary exigency and in view of the decline in the rate of receipt of new applications, DMEA issued reduction-in-force notices to 18 percent of its staff in February. The Bureau of Mines and Geological Survey made a similar reduction in personnel assigned to DMEA work.

DMEA issued amendment No. 3 to DMEA Order No. 1 and subsequently issued DMEA Order No. 1, amended, to incorporate parts of previous amendments and to change the order so as to conform with the current program. Amendment No. 3 was issued in compliance with the Office of Defense Mobilization directive of August 31, 1953, eliminating further contract arrangements which obligate the Government to stand 90 percent of the cost, as well as eliminating five minerals from those eligible for exploration assistance, thus further restricting assistance to specific minerals in shortest supply. On March 23, 1954, DMEA issued DMEA Order No. 1, amended, pursuant to ODM directive of February 9, 1954, reinstating 19 minerals as commodities eligible for exploration assistance, thus making a total of 33 eligible minerals for which the Government's share of the cost for approved exploration work is either 50 or 75 percent. The amended order also restated the "allowable costs" of an exploration project, clarified and made more specific the provisions for "repayment by operator," and made other minor changes for the protection of the Government's interests.

Extension of the Government's buying programs for asbestos, beryl, chromite, mica, manganese, tantalum-columbium, and tungsten, changes in mica specifications, and further clarification of titles to mining claims filed on lands held under oil and gas leases with respect to uranium aided in the stimulation of exploration.

Although some projects are recessed until more favorable prices prevail, it is anticipated that the Government's announced policy of purchases for the national stockpile will encourage the operators to restart their projects. Substantial quantities of minerals have been found; and although current production is small, principally from ore removed during the exploration work, the ultimate production from successful projects undoubtedly will be important to the national economy and defense. In addition, during the search for higher grade deposits, currently uneconomic mineral deposits have been found which can be brought into production in times of emergency. These latter deposits constitute a reserve of strategic minerals which is an important element in the Nation's mobilization base.

Defense Solid Fuels Administration

W. F. Hahman, *Administrator*

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THE Defense Solid Fuels Administration, which was established in December 1950 to handle the responsibilities of the Department in respect to the mobilization of solid fuels for defense, was abolished at the close of business on June 30, 1954. The continuing responsibilities of the Department for the mobilization of solid fuels were delegated to the Director of the Bureau of Mines, effective July 1, 1954.

During fiscal year 1954, the Defense Solid Fuels Administration was concerned principally with the problems relating to attaining an adequate capacity of facilities for the mining of coal of metallurgical quality and the production of coke. The relation between coal requirements and mine capacity in Alaska also received considerable attention.

On July 1, 1953, the staff of DSFA consisted of nine employees two of whom were assigned to the Office of the Secretary for half of the fiscal year while investigating the coal situation in Alaska. On June 30, 1954, when DSFA was abolished, there were only four employees.

COKE PROGRAM

The coke program was one of the most important problems during fiscal year 1954 and will continue to be a problem in fiscal year 1955.

The Office of Defense Mobilization anticipates that by January 1, 1955, blast furnaces in operation will have an annual capacity of 83,000,000 tons of pig iron. This will require a capacity of 84,000,000 tons of coke to operate not only the blast furnaces at capacity but also to meet the requirements of other industrial users of coke. Some of the requirements will be provided by beehive ovens but the major production will have to come from byproduct ovens.

In addition to the 83,000,000 tons of pig iron capacity expected to be in operation by January 1, 1955, necessity certificates have been issued for an additional capacity of 2,000,000 tons of pig iron. At the time of preparing this report, it does not seem likely that this capacity will be needed nor that the certificate holders will proceed with construction. If this additional blast furnace capacity should be built, an additional capacity of 1,800,000 tons of coke will be required; however, these additional capacities could not possibly be in production until calendar year 1956.

The base date for measuring progress toward achieving the coke goal is January 1, 1950. The capacity of byproduct coke ovens at that time, as reported by the Bureau of Mines, was 73,710,000 tons. On January 1, 1954, the capacity, as reported by the Bureau of Mines, was 78,258,000 tons. Capacity on June 30, 1954, has been estimated at 79,209,000 tons and by January 1, 1955, is expected to be 79,725,000 tons, providing all coke oven batteries now operating remain in operation and are not dismantled because of age or for economic reasons.

The problem of coke capacity sufficient to meet defense needs is a continuing and important problem. During fiscal year 1954, DSFA with its limited staff maintained, within budgetary limitations, a close analysis of the status of byproduct coke capacity. During fiscal year 1955 the Department plans to make further detailed studies of defense requirements for coke and the ability of byproduct and beehive ovens to supply these defense requirements. An uncertain factor in estimating future capacity is the loss of production which is anticipated at public utility plants which face abandonment because natural gas is displacing coke oven gas. The Department will follow these developments closely and if necessary recommend steps to overcome any losses in capacity, if such losses affect the defense program. A related study is planned to measure the regional capacity of coal mines to supply coal of suitable metallurgical quality sufficient to operate the coke industry at capacity.

COAL IN ALASKA

A field study of the coal situation in Alaska was made by the former Administrator of DSFA and by two members of the staff of DSFA, who were assigned to this study for 6 months of the fiscal year. The report was completed in December 1953 and after review by the Department was submitted to the Secretary of Defense for comments, particularly with reference to military requirements for coal during the next 4 years.

Production of coal, which was around 400,000 tons in 1950, increased to about 900,000 tons in 1953 and by June 30, 1954, the capacity of coal mines in Alaska was sufficient to meet all current military and civilian demands. Defense loans, accelerated tax amortization and particularly American business enterprise are responsible for this remarkable increase in production.

If military requirements increase as anticipated, additional productive capacity will be required. The Department during fiscal year 1955 will continue to measure future requirements and promote expansion in capacity if expansion is required.

NECESSITY CERTIFICATES

Reports and recommendations on 30 applications for necessity certificates under section 124A of the Internal Revenue Code were submitted to the Office of Defense Mobilization during the fiscal year. Twenty-five were recommended for certification and five were recommended for denial. At the end of the fiscal year no applications were pending with DSFA but there was a small backlog of requests for reconsideration of denials.

Fourteen applications for facilities to produce byproduct coke and coal chemicals were recommended for certification. Based on estimates supplied by the applicants, the total investment is approximately $202,000,000 and construction will be spread over the next 3 or 4 years. The proposed facilities involve the construction of new ovens which will increase annual capacity by about 2,700,000 tons and the reconstruction of old ovens which will help maintain an annual capacity of 3½ to 4 million tons. On a national basis, it is anticipated that these gains in capacity will be partially offset by loss of capacity in old batteries and the abandonment of capacity due to economic conditions, particularly at public utility plants.

Nine applications for mining equipment and preparation facilities, estimated to cost $11,000,000, at mines producing metallurgical coal, were recommended for certification. Four applications were recommended for denial.

In addition to the above, one application for a coal mine in Alaska and one for a coal carbonizing plant in Wyoming were recommended for certification and one for a coal washing plant in Pennsylvania was recommended for denial.

In fiscal year 1955, the Department, through the small staff assigned to this work, will continue to analyze new applications, requests for extensions of time, amendments in amount, and reconsideration of applications previously denied.

During the period from December 1950 to June 30, 1954, DSFA made recommendations on 274 applications for necessity certificates with a total estimated cost of nearly a billion dollars. About $700,000,000 was recommended for certification at an average rate of 64 percent, i. e., approximately $448,000,000 of the cost can be amortized in 5 years.

DEFENSE LOANS

No applications for defense loans under the Defense Production Act of 1950, as amended, were received during fiscal year 1954; however, one application pending from the previous fiscal year was recommended for denial.

From December 1950 to June 30, 1954, inclusive, DSFA received 32 applications for defense loans, totaling $27,228,928. Five applications, amounting to $4,372,775, including $240,000 for refinancing an undisbursed loan, were recommended for approval. Twenty-four applications, totaling $20,095,993, were denied and four, totaling $2,760,160, were withdrawn by the applicant during the course of negotiations. Of the 5 loans recommended, 1 was for $2,200,000 for the construction of a new battery of beehive coke ovens in Pennsylvania and the other 4, in the amount of $2,172,775, were for coal mines in Alaska.

Division of Geography

Meredith F. Burrill, *director*

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THE Division of Geography was established to carry out the duties of the Secretary of the Interior under the act of July 25, 1947, conjointly with the Board on Geographic Names. The Division performs the research and other staff functions relating to the standardization of geographic names.

The Division's work in 1954 was again mainly concerned with areas outside the continental United States. Geographic and linguistic research was carried out leading to the standardization of approximately 200,000 geographic names for use by Federal agencies. More than 250,000 tabulating cards were punched for subsequent publication of gazetteers. These figures represent substantial increases over similar services rendered to Federal agencies in previous years and reflect improved efficiency of operations.

In addition, over 450,000 names on maps and in texts prepared in various agencies were edited for correctness of spelling and accuracy of application. About 15,000 standard names were supplied to inquirers by telephone and mail, and research briefs were prepared for over 2,500 formal decisions.

Substantial contributions were obtained from a new source of names information, namely, scholars in foreign universities under contract to supply research data on foreign names. Such data from institutions in Rome and Beirut assisted materially in the standardization of over 13,000 names in independent Arabic and Persian speaking areas.

Although, except for its inquiries service, the Division's research and staff work continues to be addressed almost wholly to names immediately required by those agencies providing working funds, real progress has been recorded. As the basic files of names processed by the Division and approved by the interdepartmental Board are continually enlarged and refined it becomes increasingly possible to meet the needs of most agencies for foreign names. A program designed to meet the needs for domestic names in comparable measure and fashion has been developed and presented for the year 1956.

United States Board of Geographic Names

The Board on Geographic Names is an interdepartmental organization established for the purpose of standardizing geographic nomenclature for use by the Federal Government. Representatives of 11 Federal departments and agencies make up its membership. Dr. H. Thompson Straw, Department of the Air Force, became chairman during the fiscal year 1954.

The Board and its committees held frequent meetings during the year to act on policies, names, publications and related matters. Basic foreign name policies were formulated to cover new areas and policies were extended and amended for areas and classes of names previously covered. The volume of the Board's activity is reflected in the statistical data included in the report of the Division of Geography.

More than 3,500 decisions were published in lists covering Canada, Mongolia, the Guianas, Peru, Hawaii, Alaska, Puerto Rico, and the United States.

The Advisory Committee on Arabic and Persian, in weekly meetings, examined and approved several thousand individual names in independent Arabic-alphabet countries. The Advisory Committee on Names in Alaska, reconstituted and redesignated the Alaskan Names Advisory Committee, rendered valuable service in providing information on Alaskan nomenclature problems. The Advisory Committee on Antarctic Names continued its work on the coast of Wilkes Land. The appointment of a fourth advisory committee, on Hawaiian names, was recommended.

Office of the Assistant Secretary Public Land Management

Orme Lewis, *Assistant Secretary*

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THE Assistant Secretary for Public Land Management discharges the duties of the Secretary of the Interior with respect to Indian and territorial affairs and the utilization and management of more than 500 million acres of public lands in the United States and Alaska.

Within this vast area lie the bulk of the Nation's undeveloped natural resources—its national parks and monuments; its refuges for wild game and fowl; and, most importantly, multitudes of pioneering people whose efforts may well hold the key to America's future greatness.

In the discharge of his responsibilities, the Assistant Secretary exercises Secretarial direction and supervision over the Bureau of Land Management, the Bureau of Indian Affairs, the National Park Service, the Fish and Wildlife Service, and the Office of Territories.

During the year all five of these agencies effected reorganizations which reversed the tendency to centralize authority in Washington and brought operating responsibility and more effective service closer to the people they serve in the field.

Wherever possible, these agencies discontinued activities which had outlived their usefulness or caused unjustified interference with individual rights. For instance, the Puerto Rico Reconstruction Administration sold its holdings to the people or to their Territorial government, and prepared to be out of business by February 15, 1955; in the Virgin Islands, the Federal Government got out of the hotel business by selling Bluebeard's Castle to private investors; in the United States the Bureau of Indian Affairs made a good start in its program to terminate unwanted, unneeded supervision over the affairs of Indian tribes whose social and economic advances have made such action long overdue; and, the Fish and Wildlife Service amended its procedure to eliminate the old irritating and unnecessary "period of secrecy" that preceded announcement of migratory waterfowl hunting regulations.

In the development and conservation of the Nation's resources—both human and physical—aggressive actions were taken by all five of the agencies within the Office of the Assistant Secretary for Public Land Management.

The Bureau of Indian Affairs advanced toward three major goals: (1) provision of educational opportunities for all Indian children; (2) better health protection in Indian homes and communities; and (3) broadening of economic opportunities for Indian wage earners. Accomplishments included providing facilities for some 8,000 Navajo youngsters who never before had an opportunity to go to school; action leading to transfer of the Indian health program to the Public Health Service; and operation of a successful relocation service which helps Indians move away from the reservation to find jobs in communities where employment opportunities are more abundant and rewarding.

The National Park Service and the Fish and Wildlife Service continued to make great contributions to the cause of intelligent conservation. The scenic treasures of the great national parks were preserved intact, while the area administered by the National Park Service was increased by 368,000 acres, largely through extension of the boundaries of Everglades National Park and acquisition of land inside the boundaries of other parks. The Fish and Wildlife Service, likewise, expanded its protection of waterfowl over large areas of wetlands.

A revitalized public land program was developed following reorganization of the Bureau of Land Management. Transfer of operating authority from Washington to Bureau offices in each of the Western States, where the bulk of the public lands are located, filled a long-standing void in public land policy. Now the claims of citizens to public lands and leases can be settled expeditiously on the spot by the people who manage and know the lands. Time-consuming delays and costly negotiations through intermediaries in Washington are avoided.

The response of homesteaders, prospectors, ranchers, farmers, and industry to the Department's program of use without abuse of the land has been healthy and encouraging.

The rate of settlement of lands and minerals cases advanced from 40,000 a year before reorganization to the current rate of 100,000 a year. And this was accomplished without an appreciable increase in personnel.

The rights of individuals to claim lands and minerals under the many land laws enacted by Congress are being strictly observed. The rights of States to extensive school section lands in the public domain were recognized. The task of surveying the public domain has been speeded up to enable the States to select the lands to which they are entitled.

A start was made on development of the untold wealth of the submerged lands on the Outer Continental Shelf. Leasing maps were prepared covering 12 million acres off the Louisiana and Texas coastlines. These formed the basis for bids which brought some $140 million into the Federal Treasury as a bonus for the rights to lease about 800,000 acres of submerged land.

Conservation work on the Federal range was accelerated and plans were made for a 20-year program of soil-conservation work. As the year ended, soil-conservation projects had been installed on about 18.5 million acres of Federal range. Over a million acres of depleted range have been revegetated; more than 100,000 acres were reseeded last year. The sustained-yield forests managed by the Bureau produced their greatest yield in their history.

In territorial areas, the Office of Territories made progress in its historic mission of providing increasing opportunities for territorial peoples to participate in representative government. A revised Organic Act for the Virgin Islands was drafted and sent to Congress and has now been enacted. The Government of the Trust Territory of the Pacific Islands was reorganized.

One example of the sound business practices introduced into the Territories was the infusion of new management into The Alaska Railroad. The railroad, which lost $800,000 in 1952 and $42,000 in 1953, made a profit of $766,000 last year.

A more detailed report of the accomplishments of the five agencies within the jurisdiction of the Assistant Secretary for Public Land Management follows.

Bureau of Indian Affairs

Glenn L. Emmons, *Commissioner*

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FURTHER narrowing in the scope of Bureau activities and sharper focusing on major Indian problems were the two primary trends for the Bureau of Indian Affairs during the 1954 fiscal year.

One of the first major developments contributing to a reduction of Federal responsibilities in Indian affairs was the passage of Public Law 280, approved August 15, 1953. This law brought Indian lands in California, Minnesota (except the Red Lake Reservation), Nebraska, Oregon (except the Warm Springs Reservation), and Wisconsin (except the Menominee Reservation) under the criminal and civil jurisdiction of the five States mentioned and largely relieved the Bureau of further law enforcement duties in the affected areas. Some staff work was necessary, however, to facilitate the transition toward full assumption of jurisdiction by the States. The transfer, which was approved in advance by all five of the States and by the major Indian groups involved, produced no serious or outstanding problems during the fiscal year.

Just two weeks before the approval of Public Law 280 another important development looking toward reduced Federal participation took place when the Senate passed by voice vote House Concurrent Resolution No. 108 which had previously been adopted by the House of Representatives. This Resolution had three main features. First it declared that the policy of Congress is to make the Indians of the United States, as rapidly as possible, subject to the same laws and entitled to the same privileges and responsibilities as other citizens. Secondly, it stated the "sense of Congress" that nine specifically designated aggregations of Indians (i. e., those residing in 4 States and 5 additional tribal groups) should be freed from Federal supervision and control at the earliest possible time. Thirdly, it called upon the Secretary of the Interior to submit recommendations for legislation which would accomplish the purpose of the resolution with respect to the designated groups.

In compliance with this mandate, the Bureau consulted with the Indian groups involved as fully as time permitted in the fall of 1953 and then sent forward legislative recommendations designed to achieve the intended purpose. These were transmitted to Congress by the Department at the beginning of the 1954 congressional session. The recommendations covered the Indians of California, Florida, New York, and Texas; the Flathead Tribe of Montana; the Klamaths of Oregon; the Menominees of Wisconsin; the tribes of Kansas and Nebraska under jurisdiction of the Bureau's Potawatomie field office; the Chippewas of the Turtle Mountain Reservation in North Dakota; and one additional group not included in the concurrent resolution—the Indians of western Oregon. Legislation for the latter group was submitted without regard for the congressional mandate since the Indians had on several occasions expressed a desire for early termination of Federal trusteeship over their property and affairs.

In addition to these recommendations submitted by the Department, three other bills designed to terminate Federal responsibilities for particular Indian groups were introduced during the congressional session—one covering a number of small bands and groups in Utah, another involving several of the Indian colonies and reservations in Nevada, and the third providing for a division of assets between the mixed-blood and full-blood elements on the Uintah-Ouray Reservation in Utah. This last bill was regarded as particularly significant since it was developed chiefly by the Indians themselves with only incidental help from the Bureau. Under its provisions Federal responsibilities for the mixed-blood group on the Reservation would be terminated in 7 years and a development program for the full-blood segment would be authorized to prepare them for assumption of full independence at a later date.

Although hearings were held on all of these "termination" bills except in the case of the New York Indians, the only one actually enacted during the fiscal year was the Menominee legislation which was approved as Public Law 399 on June 17. Under its provisions the tribe has until December 31, 1958 to prepare for termination of Federal trusteeship and special services, and is authorized to employ management specialists for the development of tribal plans and programs during the interim period. Other termination bills which were sufficiently advanced in the legislative process at the close of the fiscal year to make their enactment seem likely during the 83d Congress were those covering the Klamaths and the coastal Indians of Oregon, the small bands of Utah, the Uintah-Ouray group, and the Alabama-Coushatta Tribes of Texas.

Two other important pieces of legislation designed to narrow the scope of Indian Bureau responsibilities were introduced. One was

H. R. 303 which would transfer all of the Bureau's health activities and responsibilities to the United States Public Health Service. The other was S. 3385 which would transfer the Bureau's extension program (including agricultural assistance, home demonstration work, and 4–H Club activities) to the Department of Agriculture for administration by the land-grant colleges of the several States. The Department submitted favorable reports on both bills. Although neither was enacted during the fiscal year, H. R. 303 was passed by the House and both bills were under active congressional consideration as the period ended.

Several major developments of the year contributed to or reflected a sharper focusing of Bureau manpower and resources on outstanding problems and needs of the Indian people.

One of these was a survey of the Bureau's administrative organization and program activities carried out in the fall of 1953 by a secretarially appointed team consisting of three business men, two Departmental representatives outside the Bureau, and one congressional staff member. In accordance with the recommendations of the team, an extensive reorganization of the Bureau was launched and largely carried through to completion during the latter half of the fiscal year. The result should be a more closely knit organization better equipped to deal effectively with the truly urgent problems in Indian affairs.

Also in the fall of 1953 the newly appointed Commissioner of Indian Affairs, Glenn L. Emmons, made an extensive tour of the major Indian areas of the country in response to a specific suggestion by the President. The Commissioner's primary purpose was to learn firsthand about the problems and needs, hopes and aspirations of the Indian people. Following completion of the tour in November, top-priority attention was given to three outstanding problems: (1) a broadening of educational opportunities to accommodate all Indian children of school age at the earliest possible date, (2) provision of better health protection or preventive medicine service in Indian homes and communities, and (3) the creation of greater opportunities for Indian economic advancement through a combination of development activity on or near the major reservations and continued assistance to the Indians in off-reservation relocation. During the balance of the fiscal year substantial progress was made in all three areas of activity.

The most urgent education problem demanding Bureau attention was found on the Navajo Reservation where nearly half of the school-age population was unable to attend school during fiscal 1954 primarily because of lack of facilities. Following a quick survey of the situation by Washington staff people in December, plans were drawn up for a Navajo emergency education program aimed at providing school opportunities by the fall of 1954 for nearly 8,000 Navajo children in addition to the total of more than 14,000 previously enrolled. The plans involved (1) construction of new facilities and enlargement of existing facilities on the Reservation, (2) greatly expanded use of trailer-type schools in the more isolated localities, (3) increased enrollment of Navajo children in Bureau boarding schools off the Reservation, and (4) provision of dormitory facilities in communities bordering the Reservation where Navajo children could be enrolled in the regular public schools. By the end of June all phases of the program were moving forward at an encouraging pace with good prospects for achievement of the announced goals during fiscal 1955.

In the direction of better health protection the Bureau took steps during the year to enlarge its preventive medicine activities on reservation areas throughout the country. Sanitary engineers were added to the staff at the Aberdeen, Albuquerque, Billings, Minneapolis, Portland, and Juneau area offices and 18 additional young Indians were trained as sanitarian aides at the Phoenix Medical Center for duty on the reservations. Upon completion of the course, it was contemplated that these aides would work under supervision of the professional sanitarians bringing the benefits of modern sanitation measures directly into Indian homes and communities.

On the economic front plans were developed during the year under the leadership of Commissioner Emmons for a series of reservation surveys to be conducted under private auspices and without cost to the Government. Three prominent citizens interested in Indian affairs—Lawrence F. Lee, former president of the United States Chamber of Commerce, David T. Beals, president of the Interstate National Bank of Kansas City, Mo., and Dr. Clyde Kluckhohn of Harvard University—were persuaded to take the lead in organizing a nonprofit corporation for this purpose. The thought was that the corporation would solicit grants from private foundations for financing the surveys and that the studies would actually be conducted by organizations specializing in this type of work. It was contemplated that the surveys would provide the basis for additional economic development and greater Indian employment opportunities in and around several of the major reservation areas.

NAVAJO-HOPI REHABILITATION

The most significant development of the year under the long-range rehabilitation program for the Navajo and Hopi Tribes was the rescheduling of school construction work in accordance with the objectives of the Navajo emergency education program. As indicated above, the plans called for a substantial increase in reservation school facilities by the fall of 1954.

Under the irrigation phase of the program studies of the feasibility of the proposed San Juan-Shiprock project were continued in cooperation with the Bureau of Reclamation and construction progress was achieved on both the Hogback and Red Lake projects. At Hogback 6 miles of canal excavation and about 45 percent of the structural work were completed. At Red Lake the west side main canal, laterals and distribution system were finished and 800 acres subjugated.

Road construction work advanced chiefly on route 3, between the New Mexico line and a point near Cameron, Ariz., along a route which was given top priority with the concurrence of the Navajo Advisory Committee. Work was completed on 26.1 miles of grade, 43.3 miles of surface, and 25.1 miles of bituminous surface. In addition, 4.5 miles of surface was completed on a section of route 8 between Chinle Junction and Chinle.

Other noteworthy accomplishments under the long-range program included the near completion of a new 75-bed hospital at Tuba City, the drilling of 51 additional wells for range water supply, appointment of a business manager and business management committee by the Navajo Tribe, continued progress in soil and moisture conservation, and further activities in ground water studies and mineral surveys.

PROGRAM DEVELOPMENT

One of the Bureau's most important projects during the first half of the fiscal year was the development of drafts of terminal legislation in compliance with the congressional mandate of House Concurrent Resolution No. 108. In carrying out this assignment, Bureau personnel gave special emphasis to consultation with the Indian groups affected and the State and local agencies concerned.

The procedure followed consisted of three major steps: (1) a preliminary draft of a proposed bill, covering each of the designated Indian groups, was developed solely for discussion purposes by area directors, superintendents, and central office staff; (2) representatives of area and agency offices arranged for meetings with Indian people, officials of State and local governments, and other interested persons to discuss with them the preliminary draft and invite an expression of their views and suggestions; and (3) proposed bills and basic information relating to the Indian groups were prepared and submitted to Congress through departmental channels.

The wide variations between the tribes and groups in development of resources, progress of integration into the local community and other factors made it necessary to modify the proposed legislation to fit the needs of each tribe or group. Basically, however, all of the bills were designed to accomplish three specific purposes; (*a*) terminate Federal trusteeship over tribal and individual property; (*b*) terminate special Federal services, and (*c*) give Indians the same status as other citizens in the States in which they reside.

Certain features were common to practically all of the bills. One of these was a provision making the tribe responsible for preparation of a tribal roll but also giving individual members the right of appeal to the Secretary. When the final roll is established, each member of the tribe is given a personal property right in the undivided tribal assets and, after termination of trusteeship, may dispose of his individual interests as he wishes. As far as the tribal group is concerned, it may either organize into a corporation for the continued management of its property or arrange for a transfer of title to a trustee of its choice. If the tribe fails to exercise an option, the Secretary will transfer title to a trustee of his choice for liquidation purposes only, with the understanding, however, that for an additional period of 6 months the tribe may still select a course offered under the option. The bills also provide that individually owned property is to be transferred to the respective owners and that all trust patents will be converted into fee patents on a specified date. They stipulate that the Secretary is to protect the rights of any individuals who are not able to manage their own affairs, and provide finally that when the Federal trust is terminated, the Secretary is to publish a proclamation to that effect and the Indians concerned will be in the same status as other citizens and have all the rights, privileges, and responsibilities.

The time period for completing the adjustment programs under the proposed legislation varies from 2 to 5 years, depending upon the time needed for an orderly transition and adjustment.

Menominee. On June 17, 1954, a monumental step was taken in the Federal administration of Indian affairs when President Eisenhower signed into law H. R. 2828 (Public Law 399) which provides for the end of Federal supervision over the property and affairs of the Menominee Indian Tribe in Wisconsin. This legislation represents the culmination of many years of planning directed toward preparing the Menominees to assume their place in the non-Indian society and was developed when it was mutually agreed by the Menominee Indians, the Congress, and the Bureau that the Menominee Tribe was prepared for a program leading to the full and unrestricted management of its own affairs. The legislation, in recognition of the accomplishments of the Menominees in handling their affairs, provides a framework within which suitable arrangements for a termination of Federal supervision may be accomplished by December 31, 1958.

MISSOURI RIVER BASIN PROGRAMING

Three hundred fifty families of the Fort Berthold Reservation were required to move because of closure of the Fort Garrison Dam. These families were assisted in the relocation of buildings, in the procurement of domestic and livestock water supplies, and in the appraisal, sale, acquisition, and trading of land to effect desirable land consolidations. By June 30, 281 families had been completely relocated, and 54 were in the process of moving.

BUREAU REORGANIZATION

In October, 1953, a survey team was appointed by the Secretary to study the organization and operating procedures of the Bureau of Indian Affairs. Three months later the team completed its study and submitted its final report to the Secretary, who approved the recommendations and instructed the Bureau to begin at once putting them into effect. Most of the organizational changes recommended by the team were effected during the fiscal year, with some modifications as approved by the Secretary, and certain additional changes in organization developed as a result of Bureau action. The reorganization was directed toward giving greater coordination and cohesion to the diverse functional activities and widely scattered field offices of the Bureau, and involved three major types of organizational changes: consolidation of functions, decentralization of operations, and consolidation of offices.

Consolidation of Functions

The Bureau's soil conservation and irrigation activities, which were formerly conducted by separate branches, and the range management function, previously associated with forest management in another branch, have been merged into a new Branch of Land Operations. This consolidation, carried out at all levels of the Bureau's organization, will give greater coordination to these closely related programs and also reduce the number of supervisory positions necessary to give direction to the programs. The Bureau's extension activity was also scheduled for inclusion in the Branch of Land Operation unless it should be transferred to the Department of Agriculture through legislative action.

The Division of Program and the Branch of Management Planning in the Division of Administration were abolished, and their functions were transferred respectively to the newly established Program Coordination Staff and Management Research Staff under the direction of assistants to the Commissioner. The Information Office was also included in the Management Research Staff.

Decentralization of Operations

The headquarters of the Branch of Buildings and Utilities, which supervises the construction of facilities required to carry out the Bureau's programs, was transferred from Washington to Albuquerque, N. Mex. Since a large volume of new construction work now under way or contemplated is located in the southwest region, principally on the Navajo and Hopi Reservations, the new location places the Bureau's construction staff close to the scene of operations. Along with the change of location, construction staffs were removed from all area offices except Juneau, Alaska, and consolidated in the new national headquarters. Simultaneously, the responsibility for maintenance of buildings and utilities was transferred from the Branch of Buildings and Utilities to the Branch of Property and Supply at the area level, and the staff for this function was retained at the area offices. The total effect of this change has been a reduction in supervisory and technical positions and expenses. There is also a gain in efficiency through the shortening of lines of communication and greater utilization of staff specialists resulting from consolidation of the construction personnel in one location.

During the year plans were also made for transferring the headquarters of the Branch of Relocation from Washington to Denver, Colo. A study of the operations of this function revealed that greater efficiency and economy could be achieved through the consolidation of the staff and central location in a western region, easily accessible to the field relocation offices and the area offices. This office will be able to provide staff assistance to the area directors without having staff personnel located in the area office on a full-time basis, thereby making it possible to give greater emphasis to the direct operating function of assisting Indian workers to relocate in industrial and other areas where employment is available.

Consolidation of Field Offices

On April 1, 1954, the former Window Rock and Albuquerque area offices were abolished and a single area office at Gallup, N. Mex., was established in their stead. This change reduced the number of area offices from 11 to 10 and also eliminated two of the situations where the combined area office-agency organization existed.

Other Organization Changes

The Branch of Credit was transferred from the Division of Resources to the Division of Administration. This change is being effected at all levels of the Bureau's organization to achieve closer association with the accounting and finance activities of the Bureau. The Resources and other appropriate program personnel will continue to advise as to the feasibility of various loan applications.

Plans were also made for transferring the Hopi Agency at Keams Canyon, Ariz., from the former Window Rock area to the jurisdiction of the Phoenix area. This transfer, however, is merely an administrative move and does not affect the substantive rights of the Hopi or Navajo Indians with respect to the land involved.

One other change of note was the removal of the audit function from the Fiscal Section and its establishment as a separate branch in the Division of Administration. This change is designed to provide an effective internal auditing procedure independent of the fiscal activity.

HEALTH ACTIVITIES

Death and disease among the Indians continued to decline. Yet the health of the Indian people, although improved, remained at a level below that of the general population. Proportionately, the Indian population during 1953 has 20 times as many deaths from measles as did the non-Indian population, 9 times as many deaths from tuberculosis, 4 times as many deaths from pneumonia and influenza, 3 times as many infant deaths, and twice as many accidental deaths. Heart disease, cancer, apoplexy, and other causes of death associated with advanced years of life were relatively infrequent among the Indians, a reflection of the much shorter average life span of these people.

Tuberculosis remained the most frequent cause of serious illness and disability. As in past years, the next most important illness requiring hospital care was diarrhea and enteritis in infants and young children. In terms of frequency of occurrence, dental caries and upper respiratory infections are still high as leading causes of health impairment.

Medical and Hospital Care

At the beginning of the 1954 fiscal year, 59 hospitals were being operated by the Bureau. During the year the new 400-bed medical center at Anchorage, Alaska, was opened; operations were suspended, however, at Wind River, Wyo., and Warm Springs, Oreg. By the end of the year 58 hospitals were in operation with a total authorized bed capacity of 2,840 divided as follows: 1,473 general, 1,292 tuberculosis, and 75 orthopedic. On an average day these beds were utilized by 1,250 general patients, 1,190 tuberculosis patients, and 60 orthopedic patients.

Additional patients were cared for through contractual arrangements with hospitals operated under community or other auspices. On an average day, care was provided under this type of arrangement for 590 tuberculosis patients, 210 psychiatric patients, and 100 other patients at a total yearly cost of approximately $3,480,000.

As a means of adding to the effectiveness of the treatment of tuberculosis patients, three institutes in rehabilitation techniques were held for Bureau medical and nursing personnel. In addition, medical-social worker positions were established in the sanatoriums, medical centers, and area offices for the purpose of assisting tuberculosis patients and their families to understand the type of treatment required for the cure of the disease, and for the purpose of aiding patients in meeting the financial and personal problems which arise as a result of the disease.

To improve the utilization of drugs and medications, and assure a proper control of narcotics, a pharmacy program was initiated through the employment of qualified pharmacists in the Anchorage Hospital, Phoenix Medical Center, Talihina (Okla.) Medical Center, and the Washington office. The improved program for supplying pharmaceutical services will support the increased attention being given to modern medical procedures and better patient care.

The problem of securing sufficient staff continued in 1954. At the beginning of the year 145 medical officers were employed, 90 of whom were on detail from the Public Health Service; 138 were on duty at the end, 80 of whom were on detail from the Public Health Service. In order to meet this problem of adequate numbers of medical personnel, exploratory work was carried on at various medical colleges throughout the United States regarding the possibility of their assisting in staffing the larger Bureau hospitals through contractual agreements. The initial result was an arrangement whereby the Cornell Medical Center of New York supplies the Navajo Medical Center with a tuberculosis clinician. This plan not only will provide additional staff but improve the quality of service as well.

An energetic recruitment program as well as continuous interpretive efforts on the part of area and central office staff to improve living conditions and provide job incentive opportunities brought about some stabilization of nursing personnel, and reduced the high turn-over rate. Additional public health nurses were recruited, additional nurse-teaching positions established and filled, and a number of highly qualified, experienced personnel assigned to key nursing positions heretofore vacant. Advances were also made in relation to improvement of personnel policies, living conditions, and job incentive opportunities.

Public Health and Preventive Services

It will be noted that the leading causes of death and disability among the Indians are those which have given way in the general population before the impact of well organized, sustained programs of prevention. Preventive and public health services of the Bureau were aimed at a continuation and improvement of tuberculosis control, dental health, sanitation, and health education.

The tuberculosis control program continued to stress the finding of new cases through the widespread use of Chest X-rays, chemotherapy, and increased use of chest surgery. Voluntary BCG vaccination of the newborn was continued. A tuberculin testing of school children by the Henry Phipps Institute for comparison with the result of the tuberculin test in comparable tribal and age groups in 1935–36 revealed that the infection rate among Indian children has been very substantially lowered. The use of isoniazed in the treatment of tuberculosis patients continued at the Navajo Medical Center in cooperation with the Cornell Medical Center of New York.

A survey of health problems in Alaska was initiated in 1954 under contractual agreement with the School of Public Health, University of Pittsburgh. As a result of this survey, a decision was made to initiate a program of chemotherapy of tuberculosis cases awaiting hospital admission. Such a program should hasten the time when the rate of tuberculosis among Alaska natives is brought down to the level of the general population in the United States.

During the year the program to improve sanitation of Indian homes and communities was given special impetus as a part of the drive to lower the major causes of disease and death among the Indian populations. Of major importance was the recruitment and orientation of 18 additional Indian sanitarian aides. The field staff of professional or technical personnel was increased to provide a total of 10 sanitary engineers, 3 sanitarians, and 33 sanitarian aides, the latter to be located in key spots of the reservations and Alaska. Special emphasis is given to the development and protection of family and community water supplies, construction and maintenance of facilities for the disposal of excreta, refuse and garbage, and the control of flies and other insects. The work is carried out in cooperation with Indian tribal councils, as well as with State and local health agencies; it is directed to an eventual integration of these services with the State and local governments.

Contractual arrangements were further expanded with State, local, and community groups in the implementation of a policy of transferring responsibility for health activities and services to local facilities or to the Indian himself, wherever suitable facilities, services, and attitudes can be found.

Dental services were modified in 1954 to concentrate both control and preventive services in the areas of severest need. Community dental programs have been established in areas where contractual agreements can be set up. These result in more preventive control, protective services, and conservation of teeth for the cost involved than could otherwise be obtained.

Cooperation on health education increased during the year with State health departments, private organizations, and universities. The Bureau collaborated with private and university radio stations in presenting broadcasts on Indian health problems. An intensive educational campaign was initiated for the health of Indian seasonal agricultural workers. Educational projects were also carried on in selected areas to reduce infant deaths, to inform Indian leaders about tuberculosis control, basic sanitation, and healthful living conditions. Reservation health personnel initiated and assisted in producing a teaching film in the Navajo language for Navajo adults on the control of diarrhea and enteritis in young children. A training program was inaugurated to prepare Indian aides to assist and interpret in connection with community health education activities and in preventive health work. The expanded health educational program provides for six public health educators and for closer working relationships with comparable personnel in the health departments of key Western States.

EDUCATION

Total enrollment of Indian children, ages 6 to 18, in schools of the United States and Alaska during fiscal 1954 was estimated at approximately 104,000. More than half, 56.1 percent, were in public schools, 34.1 percent in Federal schools, and 9.8 percent in mission and other schools.

In 1954 the Bureau negotiated contracts with 15 States, 28 districts in 4 other States, and the Territory of Alaska, under the Johnson-O'Malley Act, covering reimbursement for the education of Indian children in the public schools. When these States were given the alternative of applying for Federal aid under Public Law 874 (81st Cong., 2d sess.), all elected to remain under the Johnson-O'Malley contract status.

The Bureau operated during the year a total of 85 boarding schools, 193 day schools, 18 instructional aid schools, 6 trailer and 5 hogan schools, enrolling approximately 36,500 children. At four locations, where the instruction function was transferred to the public school districts for all of the grades, the Bureau maintained dormitory facilities for approximately 600 additional children enrolled in the public schools. Instruction was furnished to more than 300 children convalescing in four sanatoria operated by the Bureau.

More than 75 percent of the children enrolled in Federal schools in 1954 were fullblood Indians, and only about 5 percent were less than halfblood. To qualifiy for enrollment in Federal schools, children must be at least one-fourth degree Indian blood.

Vocational schools continued maintaining placement records of graduates. In four of the schools sampled for graduate placement—Chemawa, Albuquerque, Phoenix, and Sherman Institute—the following results were observed:

Out of 229 total graduates, 47.2 percent were in jobs related to their training; 14 percent in other jobs not related to training; 6.5 percent were in the armed services; 12.2 percent continued training; 1.7 percent were housewives; 4.4 percent were awaiting placement and 11.8 percent returned to the reservation. The present status of 2.2 percent was unknown.

New curriculum materials developed by the Branch of Education and made available to teachers in Bureau schools included Minimum Essential Goals for Indian Schools at grade levels 7, 8, 9, 10, 11 and 12. These materials serve as basic curriculum guides and are designed to meet the special needs of Indian children.

Over 500 employees from the Indian schools of United States and Alaska attended the 1953 summer school at their own expense. The summer school for in-service training of educational personnel was held at Intermountain School, Brigham City, Utah, June 1 to 28. The theme was the problems of cultural change.

One other major development of the year was the formulation of the Navajo emergency education program referred to above.

WELFARE

In the welfare field the Bureau continued its activities designed to strengthen family life when found to be unstable, to encourage a proper use of family income, to assist persons toward self-support, to protect children, and to stimulate youth toward independence. Engaged in this work were 38 social workers operating in 27 of 46 local jurisdictions of the Bureau, directed by 9 area social workers with the assistance of 5 area child welfare workers.

General Assistance

Increased general assistance was necessary in areas of the Southwest due to drouth and in Alaska due to failure of the salmon run. The drop in cattle prices affected all areas where raising stock is a source of livelihood, and policies in regard to grazing permits caused problems on the Navajo.

In some areas it has been difficult to determine justifiable need due to overwhelming applications for assistance. Patterns of communal sharing, late application for available jobs, selection of migratory and seasonal labor rather than steady, covered employment, taking jobs and leaving them, and poor use of income bring large groups back to the reservation without adequate provision for winter months. However, in other areas improved methods of relief administration, encouraging migratory workers to budget their summer earnings to help meet winter needs, and planning with families to budget income from oil bonuses and various leases on a monthly basis reduced to a considerable extent wasteful expenditure, and increased the ability of the family to care for its own needs.

Social Services

The necessity for granting assistance was the earliest reason for the placement of a social worker in an agency. While assistance is still a problem, the demands of the agencies are changing as they are meeting more and varied requests for welfare services. Fort Hall, Idaho, required a worker skilled in developing leadership on the reservation, a worker who could bring groups of people into common thinking and united action to better their living conditions and help them develop understanding and the use of a wide range of available resources including not only the usual services but also the vocational and art programs of the State college, the eye program of the State Board of Health, and business consultation of interested private persons. Such services will gradually assist the Indian to organize his personal and financial resources toward self-reliance and independence.

Services to Indian Tribes

In Portland, Oreg., the Court of Domestic Relations and the juvenile programs of the police department are always open to members of tribal courts and many have taken advantage of the opportunity to observe court procedure and program. The White River Apache secured the services of the National Probation and Parole Association to make a study of juvenile delinquency on the reservation. Their study "Good People in Bad Trouble" was presented simply but tellingly and translated so that the information and recommendations were available to every tribal member. The Southern Ute employ a tribal welfare worker to visit neglected old persons, helping them buy their food, giving them automobile rides and, in general, providing the care that is ordinarily furnished by immediate family relatives.

During the year members of the Jicarilla Apache Tribe and the Ute Mountain Ute Tribe each assumed tribal responsibility under the guidance of the Bureau for protecting the interest of minors in the per capita distribution and allocation of tribal funds. The Jicarilla Apache Tribe is entering an agreement to establish a Minors' Trust Fund in a commercial bank operating under New Mexico State's law. The Ute Mountain Ute Tribe is assuming responsibility for protecting minors' interests in Ute Mountain tribal rules and regulations for family plans.

Members of other tribes, such as those at Southern Ute and Uintah and Ouray, also showed development in the assumption of greater family responsibility and more prudent management of minors' funds according to principles of parental guardianship recommended to their respective tribal business managers or officers in charge of tribal affairs.

Services to School Children

During the fiscal year approximately 5,000 studies of individual children in Bureau boarding schools or in mission schools were made or reviewed, and progress was achieved in planning for children who are in these schools for other than educational reasons. Children have been enabled to attend public school through arrangements for free lunches, changes in bus routes, and by the provision of clothing and other school necessities. Once in public school, effort is made to see that there are no obstacles to adjustment. Indian parents who have long looked upon the boarding school as a right, and who have found the care of their children by the school to have economic advantages, have discovered anew the pleasure of having their children at home and have put forth effort to restablish and unify the family. In some cases of extreme parental neglect, foster care has been provided.

Federal-State Relationships

Although few States accept full welfare responsibility for the Indian, some would, had they sufficient staff and funds. Since the welfare program, staff, and appropriation vary in each State, as does the Indian population in relation to the total population, consideration of contractual relationships must also vary. Contracts were negotiated in fiscal 1954 with Minnesota for foster care and general assistance in distressed counties and with Wisconsin for foster care. Negotiations were begun with Nevada and South Dakota for social services and foster care of children on a selective basis.

RELOCATION

During the 1954 fiscal year, 2,163 Indians were directly assisted to relocate under the Bureau's relocation program. This included 1,649 persons in over 400 family groups, and 514 unattached men and women. In addition, over 300 Indians left reservations without assistance to join relatives and friends who had been assisted to relocate. At their destination, Bureau Relocation Offices assisted this group also to adjust to the new community. The total number of relocations represented a substantial increase over relocations during the previous fiscal year.

Of the 2,163 Indians assisted to relocate, financial assistance, to cover all or part of the costs of transportation to the place of relocation and short-term temporary subsistence, were provided to 1,637 Indians, in addition to relocation services. This number included 1,329 persons in over 300 family groups, and 308 unattached men and women. An additional 526 Indians, including 320 in approximately 100 family groups and 206 unattached men and women, were assisted to relocate without financial assistance, but were provided relocation services only. These services included counseling and guidance prior to relocation, and assistance in establishing residence and securing permanent employment in the new community.

In addition to the above-mentioned persons who were assisted to relocate, Bureau Relocation Offices assisted a number of Indian workers to secure employment which did not involve relocation, and cooperated with public employment offices and the Railroad Retirement Board in recruitment of Indians for temporary and seasonal work. However, in order to concentrate on providing relocation services, placement activities which do not involve relocation have been progressively decreased and responsibility for such placement activities has been largely left to established employment agencies. In recognition of this emphasis, and following the recommendation of the survey team for the Bureau of Indian Affairs, the name of the former Branch of Placement and Relocation was changed during the year to the Branch of Relocation.

Approximately 54 percent of the Indians assisted to relocate came from 3 northern areas (Aberdeen, Billings, and Minneapolis), and 46 percent came from 4 southern areas (Anadarko, Gallup, Muskogee, and Phoenix). They went to 20 different States. The Los Angeles and Chicago metropolitan areas continued to be the chief centers of relocation.

On the reservations there was continued interest in relocation throughout the year. Relocation assistance funds were used up in almost every area, and at the end of the year there was a backlog of applications for relocation. Letters from relocated Indians to friends and relatives back on the reservation, describing their experiences and new standards of living, served to stimulate interest as did a decrease in employment opportunities in the vicinity of some of the reservations and a marked decrease in railroad employment.

There was a slight tightening of the labor market during part of the year. However, through intensive efforts on the part of field relocation offices, it was still possible to assure permanent types of employment to almost all qualified workers who requested assistance in settling away from reservations. Field relocation offices followed a policy of securing employment for Indians in diversified industries and with a large number of employers. This policy proved of great benefit when industrial disputes developed in certain industries on the west coast.

To adjust to changes in the labor market which reduced employment in military installations and certain Government projects, the field relocation office formerly located in Salt Lake City was transferred to Oakland, Calif., effective June 1.

The Chicago Field Relocation Office, in recognition of the needs of the growing number of relocatees in that city and in accordance with the Bureau policy of encouraging the development of non-Bureau facilities for Indians, assisted in the establishment of an All-Tribes American Indian Center in Chicago. This center raised its own funds, and under the directorship of a board composed almost entirely of Indians, began providing opportunities for Indian relocatees to meet, engage in social and recreational programs, exchange experiences, and assist each other. Its operations were completely independent of the Bureau.

LAW AND ORDER

The most important development of the year in this field was the enactment of Public law 280 referred to above. Separate bills for each of the five States covered by the legislation and, additionally, for Nevada had been introduced early in the Congress. The House Committee on Indian Affairs consolidated all the bills, except for Nevada, into one which was enacted as Public law 280.

An amendment was made to the bill before enactment which provided for the assumption of jurisdiction by additional States over Indian country. This amendment was criticized by a number of Indian groups because it did not provide for Indian consent or consultation and they urged the President to veto the bill for that reason. When the President approved the bill, he stated that he did so because of the fact that its basic purpose represented an important step in granting complete political equality to Indians. At the same time, however, he requested the Congress to enact an amendment requiring consultation with Indian groups and Federal approval before additional States acted to assume jurisdiction under Public law 280. A number of such bills, including some sponsored by the Department, were being considered by the Congress at the close of the fiscal year.

The enactment of Public law 280 has enabled the Bureau to reduce expenditures for law-enforcement purposes although this reduction was not as great as might be supposed because much of the expense of law enforcement in the five States affected by the law had previously been borne by the Indian tribes themselves.

The transition from Federal and tribal jurisdiction to State jurisdiction in the five States was accomplished with very little friction and unrest. A question as to whether the transfer of jurisdiction was effective was raised by an Oregon court but that court, after studying the matter, held that it had jurisdiction and proceeded to exercise it. The ultimate result of the law has been to guarantee the Indians police protection that they themselves had been unable to furnish. The Menominee Tribe, which had objected to inclusion in Public law 280, during the year changed its mind and, at a general council meeting in April, adopted a resolution asking the Congress to amend the law so as to extend the State laws to the reservation.

During the year the Bureau continued its efforts to improve law and order conditions by seeking more efficient operation by tribes and Bureau personnel, encouraging assumption of more responsibility by the tribes in the field of law enforcement, and by conducting training schools for law enforcement personnel. Correspondence was had with the Governors of various States with Indian populations, calling their attention to Public law 280 and offering Bureau assistance in consulting Indian tribes. Negotiations with Indian tribes looking to extension of State laws to the reservations continued.

A long-sought Bureau goal was attained during the year when the Congress enacted Public law 277, approved August 15, 1953, which removed the discriminatory prohibition against the sales of alcoholic beverages to Indians outside of Indian country and provided for legalizing the introduction of alcoholic beverages within Indian country by the tribes on a local option basis. Although the Indians generally welcomed the removal of the discriminatory prohibitions outside of Indian country, only 19 tribal groups acted during the fiscal year to legalize the introduction of alcoholic beverages within their reservations.

REALTY TRANSACTIONS

During fiscal 1954 the program of transferring to the Indians themselves, either as groups or individuals, the responsibility for management of their trust and restricted properties continued at an increased rate. A total of 1,551 patents in fee, certificates of competency, and removals of restrictions were issued to Indians in this year as compared to 839 such actions in fiscal year 1953. There were 1,609 sales to non-Indians and 46 other transactions of various kinds which resulted in removal of the trust responsibility of the Federal Government. In all, more than 3,200 tracts of land were removed from trust or restricted status during the fiscal year or nearly 3 percent of the approximately 112,600 tracts in such status on June 30, 1953. These 3,200 tracts comprised a total of 500,000 acres, about 3½ percent of the acreage held by individuals. The acreage removed from the trusteeship of the Federal Government in 1954 was about 50 percent greater than in fiscal 1953. Eighty-eight tracts were purchased from non-Indians for tribes and individuals.

In addition, there were 1,572 transactions completed during the year which had no material effect on the overall acreage of land in trust or restricted status. These included sales between individual Indians, exchanges between individual Indians, sales from individuals to tribes, exchanges between individuals and tribes, conveyances of title as gifts, and other transactions including exchanges with non-Indians. These transactions assisted individuals in obtaining land for homes, blocking out pastures for grazing livestock, and obtaining better operating units. In some cases the sales between individuals represent the acquisition by one of the heirs of the interests of the other heirs. The gifts in most cases are made to members of the family, other members of the household or relatives. Many of the sales from individuals to tribes convey title to lands which will not or cannot be used by the owners but which are important to the tribes and their members because of water supply or location.

On June 30, 1954, field offices of the Bureau reported an uncompleted workload or backlog of 13,104 proposed realty transactions. Included in this total are 640 requests for patents-in-fee, 4,725 requests for supervised sales, 672 exchanges of various kinds, 139 proposed partitions, 225 requests for removal of restrictions, 24 applications for certificates of competency which, in effect, remove the trust status of the lands owned by the applicant, 1,385 farm and farm pasture and business leases, and 803 mineral and oil and gas leases, 411 rights of way, and 2,219 cases involving preparation of information required for probating estates.

At the end of the year, the total backlog of work was about the same as at the beginning of the year. During the year local Indian agency offices reported that more than 27,000 transactions of various kinds were disposed of either by approval, disapproval or in some other manner. The incoming number of transactions of various kinds, however, was about equal to the number handled. Of the 27,000 cases handled, 13,910 were related to farm and business leases, 3,518 were mineral and oil and gas leases, 476 concerned rights-of-way, and 2,059 involved probating of estates.

Only 7,213 cases contributed to the program of the Bureau to transfer, as soon as feasible, to the Indians themselves, the management of their property, or to improvement in the ownership pattern of the land in contemplation of the termination of supervision of the Government over certain groups of Indians. From a study of the time required to act on and issue patents-in-fee and complete other kinds of transactions, it is estimated that there is a backlog of more than 1 year's work for the entire staff now engaged in this activity.

During the year negotiations were completed with the tribes of the Wind River Reservation in Wyoming for conveyance to the United States of 161,000 acres of tribal land on the reservation, within the Riverton project. Legislation was enacted to approve the conveyance of the land to the United States and to authorize payment of about $1,000,000 to the tribes.

Mineral Leasing

The income received by Indians from oil and gas and other minerals in fiscal 1954 reached an all-time high of over $34,000,000. This is about $9,000,000 or 36 percent greater than the amount reported for fiscal 1953. Of the 1954 total, $19,000,000 was received from bonuses, $3,000,000 was from rentals, and the remainder of about $12,000,000 was received from royalties.

At the close of 1954 period 4,225,490 acres of Indian land were held under oil and gas leases. About 84,000 acres were held under other mineral leases and mining permits.

During the year there was steadily increasing interest in oil and gas leasing of Indian lands in the Dakota-Montana area. The discovery well brought in on the Fort Berthold Reservation in North Dakota was a significant development on that reservation and a total bonus of $2,853,393 was paid for leases there compared with $556,210 for fiscal 1953. Activity continued strong on the Fort Peck Reservation, Mont., where bonus income in 1954 was $2,728,223. There was also a revival of activity on the Blackfeet Reservation, Mont. At the close of the fiscal year bonus bids received amounted to $1,273,250. On the Navajo Reservation a total bonus of $4,583,733 was paid for oil and gas leases compared with $4,981,974 in 1953 and $1,334,934 for the fiscal year 1952.

Rentals on existing leases during 1954 were $3,228,000 as compared with rentals in 1953 of $2,073,000. Oil, gas and other mineral leases are being made on reservations in 14 States west of the Mississippi River. The Osage Reservation in Oklahoma took first place in royalty payments with a total of $5,326,054. The Wind River Reservation in Wyoming was next with the royalty income of $1,854,400. The total royalty in the entire State of Oklahoma from production on Indian lands was in excess of $8,335,000.

The total income received from leases other than oil and gas amounted to approximately $1,000,000. This came principally from royalties on asbestos, coal, sand and gravel, phosphate, lead and zinc, vanadium and uranium mining leases.

SOIL CONSERVATION

More soil conservation work was accomplished in 1954 than in any year since the inception of the program in 1940. During the first 13 years less than 1 percent of the total job was performed per year; in 1952 2 percent was performed; and in 1954 nearly 3 percent was accomplished.

The extent and effectiveness of cooperation with soil conservation districts also increased during the year. Nearly 2,000,000 more acres of Indian land were placed under formal agreement with the districts through 28 written agreements of which 13 were modifications providing for inclusion of additional Indian acreage and 15 were new agreements bringing Indian land into the particular districts for the first time. At the close of the year an aggregate area of 17,523,198 acres, comprising 31.63 percent of all Indian lands, was covered by formal agreement with soil conservation districts.

The soil and moisture cooperators contributed over 13 million dollars to the total program by their labor, materials, and money, and thus put into the effort more than $5 for every dollar appropriated. On 15 reservations on which studies have been continuing for several years farm land under conservation operations increased agricultural production 37 percent and returned to the cooperator over $3.50 for every dollar invested.

MANAGEMENT OF FOREST, RANGE, AND WILDLIFE RESOURCES

Nearly 700 million board feet of timber with a stumpage value of $9,500,000 was harvested in the calendar year 1953 from the Indian forests. About 567 million board feet of this with a stumpage value of roughly $9,250,000 was cut under contract or was used at tribal sawmills. The greatest concentration of timber sale activity during the year was in the Pacific Northwest and California, where 75 percent of both the volume and value of contract cutting was concentrated. About 13 percent of the contract cutting was on Indian forests in the Southwestern States, and the remainder was equally divided between the Lake States and the State of Montana.

Some progress was made during the year toward obtaining adequate forest inventories and the revision of forest management plans. This work has been completed on the Navajo Reservation, using the best modern techniques of aerial surveys supplemented by ground measurements. Similar inventories are in process on the San Carlos Reservation in Arizona and the Hoopa Valley and Tule River Reservations in California. All of these surveys are being paid for by the tribes, out of their own funds, and it is hoped that similar arrangements can be made with other tribes at other reservations.

The possible value of such inventories is revealed in the case of the Navajo Reservation. During the past ten years logging operations by the Navajo tribal sawmill have been held to a cut of about 13 million board feet a year because the data then available indicated that this was the maximum allowable cut under sustained yield management. The new inventory, recently completed, reveals that the allowable annual cut can safely be increased to 28 million board feet annually, and plans for expansion of the harvest are now being made. It does not follow that new surveys will indicate corresponding increases in allowable cut at all reservations, but it is obvious that more accurate information is needed in many instances.

Forest Protection

Nearly 50 million acres of Indian and Government-owned lands continued to receive protection from fire during the calendar year 1953. Of the 1,085 fires suppressed during the year, 644 or 60 percent were caused by lightning. Two reservations were outstanding from the standpoint of fire occurrence, with 277 fires on the Fort Apache Reservation in Arizona, and 182 fires on the Colville Reservation in Washington.

Protection of Indian Forests from disease continued to be a very serious problem. Control efforts were applied to the white pine blister rust infestation in the Lake States, and to a mistletoe infestation on the Mescalero Reservation in New Mexico. Control measures are made possible through cooperative arrangement and transfer of funds from the Department of Agriculture.

Range Management

During the year the Indians used about 33,400,000 acres of their range lands for grazing their livestock. The remaining 10,600,000 acres of range land was used by non-Indians under cash permits. Of the $2,700,000 cash receipts from the sale of grazing privileges, about $2,370,000 was collected in the States of North Dakota, South Dakota and Montana. Of the $3,800,000 value of free grazing by Indians, $1,720,000 originated on the Navajo Reservation in Arizona, Utah, and New Mexico. The importance of the livestock industry to the Indians, and the values of the watersheds involved, make the conservative use of these forage and soil resources of great importance. In general, the forage has been utilized in accordance with the principles of conservation. In the Southwest, however, the drought and heavy grazing pressures by the Indians in past years are continuing and this results in major problems in range management. Of particular importance in this respect are the Indian lands under the jurisdiction of the Navajo, United Pueblos, Fort Apache, and San Carlos Agencies.

Fish and Wildlife Management

In some areas fish and wildlife resources are of considerable importance to the economy of the Indians. A commercial fishery is operated by the Red Lake Indians in Minnesota and there is also commercial fishing by the Indians along the Columbia River and in the coastal waters of Washington, as well as Alaska. The total income or value of wildlife resources used in the continental United States during the calendar year 1953 is estimated to be about $2,600,000. In Alaska the commercial fishing operations during the same period were $177,069 in wages for native hire and $714,188.48 in income from the sale of fish.

Operating statement and comparison of forest and range management activities over the past 3 years

CALENDAR YEARS

	1951	1952	1953
TIMBER SALES			
Total volume of timber cut—1,000 feet board measure (includes timber cut under permit and free use)	719, 076	668, 554	696, 189
Total value of timber cut	$7, 720, 989	$8, 366, 531	$9, 567, 608
Volume of timber cut under contract—1,000 feet board measure	586, 633	542, 701	567, 249
Value of timber cut under contract	$7, 387, 827	$8, 052, 343	$9, 239, 141
FIRE SUPPRESSION			
Total number of fires	931	1, 025	1, 080
Area burned in acres	52, 076	74, 508	52, 618
Damage	$274, 523	$381, 137	$156, 125
Cost of suppression	$322, 882	$127, 590	$174, 412
RANGE MANAGEMENT			
Number of cattle grazed	650, 029	624, 848	623, 760
Number of horses grazed	94, 039	92, 885	86, 691
Number of sheep and goats grazed	884, 782	969, 679	992, 973
Cash income from grazing privileges	$2, 238, 499	$2, 526, 853	$2, 702, 350
Value of free grazing	$3, 478, 478	$3, 923, 816	$3, 801, 208
FISH AND WILDLIFE			
Value of fish and wildlife harvest	$3, 097, 824	$2, 969, 556	$2, 696, 400
Total cash income collected	$9, 626, 326	$10, 579, 196	$11, 941, 491
Total value other income including free use	$6, 909, 464	$7, 207, 560	$6, 826, 075
Total of value and receipts	$16, 535, 790	$17, 786, 756	$18, 767, 566
FISCAL YEARS			
Obligations from gratuity funds for forest and range management and fire presuppression	$1, 525, 756	$1, 851, 829	$2, 161, 507

EXTENSION

Under the jurisdiction of 10 area offices with general assistance from the central office, extension programs in 1953 were provided by a staff technically trained in agriculture and home economics for 38 Indian agencies. Extension personnel made 54,879 farm and home visits, held 3,519 meetings with an attendance of 95,699, conducted 2,096 demonstrations with an attendance of 20,681 people, and participated in 365 educational tours for 3,225 individuals.

Economic Situation

In 1930, the beginning of organized extension work with Indians, the gross agricultural income was approximately $1,300,000. During the peak income year of 1951, it reached $54 million, but due to the slump in agricultural prices, declined again to approximately $30 million in 1953.

Increased prices and the great demand for agricultural products during the past decade or so, undoubtedly account for much of the Indians' awakened interest in agriculture as well as their greatly increased income, but their adoption of improved practices advocated by extension workers has played no small part in bringing about this economic improvement and has enabled Indians to produce commodities which have found a ready market at good prices.

Home Extension Activities

In the 1954 fiscal year there were 17 Bureau field home extension agents in Oklahoma, New Mexico, Colorado, Arizona, and Mississippi with 1 field supervisor located in Washington, D. C. One-third of the home agents' time is devoted to 4–H Club work.

Assistance was given in constructing or remodeling 485 homes; in obtaining water systems for 259 families and electricity for 338; in selection and use of electrical equipment for 618; in providing proper waste disposal for 172; in providing adequate household furnishings for 872 and adequate storage facilities for 405.

During the year, 295 organized groups having 8,601 members met regularly for scheduled programs, while 181 groups met for special-interest activities. Assistance was provided 2,198 families in planning adequate food budgets; 3,991 families in food preservation and preparation; and 763 families in child feeding. Aid in clothing care, construction, and renovation was given to 4,987 families.

4–H Club Work

During 1953 extension personnel sponsored 590 4–H Clubs with a membership of 6,726 boys and girls enrolled in 9,529 projects having an estimated value of $128,437. Staff efforts were directed toward the training of local leaders, establishing a thorough understanding of the program, coordinating activities with county, State, and national policies and maintaining a high standard of work and completions.

A marked increase in the participation of Indian youths in fairs, tours, camps, and county and State contests was evident in 1953. Bureau extension workers reported 853 Indian boys and girls winning county events and 122 winners in State events.

IRRIGATION

Crops produced on 542,000 acres of irrigated Indian land in the calendar year 1953 were valued at $44,081,000. Drought conditions in the Southwest, and particularly in Arizona, over the past several years have necessitated the curtailing of farming operations because of the limited water supplies and these acreage reductions have tended to offset the increases in irrigated farming on Indian lands in other sections of the country.

Approximately 19,800 additional acres were placed under constructed works during the year. This involved the construction and extension of canals and laterals; construction of drainage systems; construction, replacement and rehabilitation of structures; land subjugation; and the drilling, rehabilitation and equipping of wells for the purpose of supplying additional water for irrigation purposes. In addition to this irrigation development work, 122 miles of power transmission and distribution lines were extended, replaced and enlarged to greater capacities to provide electrical service to 357 additional customers on and adjacent to the Colorado River, Flathead, and San Carlos irrigation project.

The more important Indian irrigation development work during the year was on the following projects:

Colorado River project, Arizona.—The work on this project involved the complete development of 2,120 acres of new lands, making a total of 35,900 acres under constructed irrigation facilities as of June 30, 1954. The overall development program on the Colorado River Reservation is the expansion of the irrigation project to its ultimate area of 100,000 acres of which 75,000 acres on the southern portion of the reservation is to be developed for use by Navajo and Hopi and other Colorado River Basin Indians to compensate for the lack of economic opportunity on their native reservations. No new Navajo or Hopi colonists were settled on the project during the year. However, those colonists already on the project who were assigned an additional 40 acres late in fiscal year 1953, moved to their new locations during the fiscal year.

During the calendar year 1953, the project produced crops valued at $3,916,871 on 33,777 acres.

Blackfeet project, Montana.—The work on this project consisted of the enlargement of the main canal and distribution system to provide for the delivery of a firm water supply to 17,000 acres. The supply was formerly limited to 14,000 acres in any one season.

Wapato project, Washington.—The work on this project was the completion of Satus unit No. 3, which provided irrigation water for an additional 1,200 acres under Satus No. 2 and 10,000 acres under Satus No. 3. This work directly benefited 218 Indian families.

During the calendar year 1953 crops produced on all units of the Wapato project were valued at $17,887,847.

San Carlos project, Gila River Indian Reservation, Ariz.—The extreme drought conditions experienced on this project in 1953 continued into the 1954 irrigation season. The maximum storage in the San Carlos Reservoir was less than 20,000 acre-feet in 1953 and less than 40,000 acre-feet in the spring of 1954. The work on this project consisted almost entirely of the rehabilitation and deepening of wells and the repair and replacement of pumps.

During the calendar year 1953 crops produced on 41,032 acres were valued at $6,380,995.

Survey Work

Surveys, investigations, and field studies were continued on various projects in order to provide additional engineering data for feasibility reports and the continuing of proper and adequate construction programs on existing projects. Work on the proposed Shiprock unit of the Navajo projects, which is the largest and principal potential development on the Navajo Reservation, involved the continuation and acceleration of the collection and preparation of data required to prepare a feasibility report for the purpose of seeking congressional authorization for construction of the project. The completion of a factual engineering feasibility report is expected by June 1955. Extensive surveys were also conducted on the Yakima Indian Reservation to determine irrigable area and cost of development, together with benefits to be derived from irrigation and flood control on Satus Creek. Surveys were also conducted for the proposed White Swan project on the Yakima Reservation. Ground-water studies are being conducted at Chiu Chui and San Xavier in Arizona and Ute Mountain in Colorado.

In addition to the usual and regular preliminary and preconstruction surveys, extensive field examinations and studies and the collection, preparation and assembling of data for protection of Indian water rights were continued during the year for use in connection with the water suits entitled *Arizona* v. *California* and *Texas* v. *New Mexico.*

ROADS

Road construction work was performed on reservations in 24 States with major emphasis on the Navajo and Hopi Reservations where $1,330,000 was allocated for this type of activity. The bulk of the work was carried on at reservations west of the Mississippi, but substantial projects were also completed in Florida, Mississippi, Wisconsin, and Michigan.

Three hundred and fifteen miles of road were graded and drained; 352 miles were surfaced, 72 of which were blacktopped and the remaining 280 miles surfaced with gravel; 2,020 running feet of bridges were constructed, most of which were short timber trestle spans over creeks or small streams. There were several large bridges of concrete and steel construction.

Of the 315 miles graded, the county governments agreed to take over 240 miles and maintain them. They also agreed to take over 247 miles of the 352 miles surfaced. This relieves the Federal Government of future maintenance expense on these roads.

The road maintenance program covered over 19,000 miles of road. It included surface maintenance, snow removal, flood damage repair, and repairs to bridges.

CREDIT ACTIVITIES

Since Indians are being encouraged to seek credit assistance from the same institutions that serve other citizens, loans made through the Bureau are playing a constantly decreasing role in the amount of credit they receive. During the 1953 fiscal year, advances by the United States totaled $1,075,754, a decrease of $1,388,081 from the $2,463,835 advanced during 1952. During the calendar year 1953, incomplete reports show that Indians received financing totaling $27,665,135 from non-Bureau sources, an increase of $5,349,284 over the $22,315,851 received during 1952.

Indians may now use their chief asset, trust or restricted land, as security for loans, with the approval of an authorized representative of the Secretary. This authority should open new channels of credit to them and permit them to utilize their main asset to secure justified financing, on much the same basis as any other citizen uses his assets. This privilege was long denied them.

Revolving Credit Fund

Through June 30, 1953, appropriations for the fund totaled $13,799,600, of which $12,550,768 was available for loans. As repayments of principal and interest are made, they are credited to the fund and are available for further loans. This revolving feature enabled the United States to lend a total of $22,660,748 through June 30, 1953. Of this amount, payments totaling $13,130,362 were due, of which $12,464,169 was paid. Additional payments of $53,591 were in transit, extension of repayment terms were granted on $137,487, cancellations had been affected on $5,583, and payments totaling $469,532 were delinquent. The repayment record in percentages for the last 2 fiscal years follows:

	1952	1953
Percent of amount due:		
Paid or in transit	89.78	95.32
Extended	8.17	1.06
Canceled	.04	.04
Delinquent	2.01	3.58

The cash balance in the funds as of June 30, 1953, was $4,014,821. Loans receivable totaled $10,190,941. A reserve for losses of $482,424 has been established.

The collectibility of some of the outstanding loans is questionable. A particularly serious situation faces the Bureau on loans made in southeast Alaska. Loans were made to four Indian villages for the acquisition and operation of salmon canneries. Fishing seasons in the areas where these canneries are located have not been favorable for several years. All four of these canneries have operated at a loss for the past 2 years. About 38 percent of the total loans receivable were owing to the United States in southeast Alaska, and the poor fishing seasons have placed these loans in jeopardy.

The cash balance as of June 30, 1953, includes interest payments of $743,828 and $916,329 received from livestock sales and settlements under authorization contained in the act of May 24, 1950 (25 U. S. C. 443). This enactment was concerned with drought purchases of livestock made mainly by the Department of Agriculture, beginning in 1934, to afford relief to stricken growers. The animals were loaned to Indians on a repayment-in-kind basis. Under the 1950 enactment this program is now being converted to a cash basis because it is believed that continuance of a credit program peculiar to the Indians will not give them needed training in customary business practices and procedures. As of June 30, 1953, the amount of Indian indebtedness in terms of cattle had been reduced from 42,551 head to 33,353.

Tribal Funds

Tribes with funds of their own available either conduct credit operations entirely with such funds or use the money to supplement funds borrowed from the United States. As of June 30, 1953, tribes were using $9,704,611 of their own funds for this purpose. Thus, on the whole, there was about 95 cents of tribal money being used for credit purposes for every dollar which had been borrowed from the United States.

Use of Funds by Indian Organizations

Repayments on loans and interest collected by Indian tribal organizations are credited to the credit fund of the particular organization and are available for further loans by the organizations within the terms of their loan agreements with the United States. Because of this revolving feature, with the $22,660,748 borrowed from the United States and the $9,704,611 of tribal funds, Indian organizations had made use of a total of $45,500,457. The types of loans and the unpaid balances were as follows:

	Enterprises	Cooperatives	Individuals	Total
Total loaned	$16,183,415	$1,344.813	$27,477,229	$45,005.457
Total repaid	7,145,692	1,181,263	18,449,634	26,776,589
Total canceled	11,401	13,576	166,375	191,352
Balance unpaid	9,026,322	149,974	8.861,220	18,037,516

The enterprises financed are operated for the benefit of all members of the tribe and include salmon canneries, tourist courts, stores, tribal farms, tribal livestock herds and various other types of activities. Cooperative associations are operated by only a part of the membership of a particular tribe.

The repayment record on loans to individuals suffered during the year due to drought in some areas, lower livestock prices, and poor fishing season. The following shows comparative figures for the past 2 years:

	1952	1953
Percent of amount due:		
Paid	92.82	92.11
Extended	1.68	1.86
Charged off	.48	.83
Delinquent	5.02	5.20

Fullblood Indians received over 57 percent of the number of loans made during 1953 and about 50 percent of the total amount loaned. Indians of half degree of blood or over but less than fullblood received nearly 30 percent of the number of loans made and about 27 percent of the amount loaned. Indians of less than halfblood received about 13 percent of the number of loans and about 23 percent of the amount loaned.

ARTS AND CRAFTS

The Indian Arts and Crafts Board continued to provide technical assistance in production and marketing to 18 organized Indian crafts groups and to many individual Indian artists and craftsmen and sponsored their products throughout the Nation by a variety of methods.

During the year the Board cooperated with various crafts groups and museums in sponsoring exhibitions and sales of Indian crafts and paintings, participated with organizations in public addresses, displays, television shows, and published four numbers of a circular for craftsmen. In addition, the Board circulated brochures and pamphlets and supplied other pertinent details to individuals and groups requesting sources for information about Indian crafts.

The production and sale of Indian and Eskimo crafts in Alaska have proved to be an important factor contributing to the economic well-being of the native population. The development of native crafts, which include skin sewing, carved ivories, jade jewelry, masks and totem poles, has been fostered by the Alaska Native Arts and Crafts Clearing House in Juneau, the Nome Skin Sewers Cooperative Association, many isolated trading posts located throughout the territory and the retail shops in various larger urban communities. To insure this development, the Indian Arts and Crafts Board has a production specialist assigned to this area who works closely with these groups and with the Bureau of Indian Affairs. Sales during 1953 made by the Clearing House and the Nome Skin Sewers alone, the only two organizations reporting directly to the Indian Arts and Crafts Board, amounted to $173,000.

The Indian Arts and Crafts Board has within the past 2 years inaugurated the development of a jade project for Eskimos with a view to supplementing income, to providing sustained employment, and to making use of a valuable natural resource belonging to the natives. Beginning at Shungnak with $300 borrowed capital, the Indian Arts and Crafts Board's production specialist established a small craft industry in jewelry, metal craft, and jade cutting. Last year sales from this project mounted to $2,000. Similar projects have since been organized at Kotzebue and Noorvik.

Sales

Sales of Indian crafts from the 18 crafts centers for the calendar year 1953 amounted to over $400,000. It is significant to note that while this amount does not equal the sales enjoyed by the crafts centers during the previous year, due primarily to a loss occurring in Alaska as a result of the significant reduction of armed services personnel in the area, the majority of the Indian crafts groups showed a steady increase in sales during 1953.

The sale of Indian crafts through the 18 crafts centers advised by the Indian Arts and Crafts Board amounts to only a part of the craft sales made directly by Indians or through dealers to the American public. Estimates from Indian agencies, traders, and retail shops indicate that several million dollars worth of crafts are sold annually. For example, at Cherokee, N. C., while over $35,000 worth of crafts were sold through the Qualla Arts and Crafts Cooperative, nearly $90,000 worth of Cherokee crafts were sold by the many local sales shops in the immediate area.

PROPERTY AND SUPPLY

It is the policy of the Bureau to discontinue any government operation under its jurisdiction that might compete with private or commercial enterprise. Progress was made in fiscal 1954 in closing dairies, laundries, garages and other Government-operated facilities that could be duplicated by commercial sources equally as well and at less cost to the Government. The Bureau will continue to withdraw from the business of telephone and electrical distribution systems, heat and power plants, and business enterprises of like kind wherever feasible.

The Bureau, in acquiring the necessary tools and supplies, is concentrating also on disposal of all unnecessary property on hand. The automotive fleet, for example, is gradually being reduced in number and the remainder being upgraded by exchange and disposal of the less serviceable vehicles. The Bureau's overall inventory of real and personal property is being reduced wherever possible.

PERSONNEL

The Bureau continued in 1954 to strengthen all phases of its personnel management program. Aggressive action was taken to reevaluate all positions throughout the Bureau as a basis for establishing and operating an effective and economical organization through the proper definition of job responsibilities and to provide an equitable system for fixing and adjusting the rates of basic compensation of individual employees. To assure highest possible competence, efficiency and morale among employees, the Bureau continued to accentuate supervisor-employee relationships, looking toward maximum development and utilization of their skills. In this connection career development was encouraged through active participation by supervisors and employees in an intensive Bureau-wide inservice promotion program. The Bureau actively engaged in an extensive, nationwide recruitment program for teachers in connections with the special Navajo emergency program. Qualifications standards for certain technical Bureau positions were developed. Continued emphasis was placed on supervisory and junior management training programs. Recruitment in shortage categories—doctors, nurses and teachers—was facilitated throughout the Bureau by establishment and operation of boards of civil-service examiners. Considerable study was given to the problem of Indian preference when functional responsibilities of the Bureau are transferred to other agencies of the Government such as the Public Health Service.

BUDGET AND FINANCE

Good progress was made during 1954 in refining and improving the new accounting system installed in Bureau accounting offices the preceding year. The budget procedures are being integrated with the system so that information supplied from the accounts will be susceptible of use for both budgeting and management purposes. Irrigation accounts were revised and simplified so as to show readily the balance due the United States at the end of any accounting period for reimbursable expenditures. Revised procedures were issued placing into effect the direct depositing procedures promulgated by the Treasury Department and the General Accounting Office. In order to facilitate Bureau operations, delegations of authority and related procedures were issued permitting the field accounting offices to approve and process various miscellaneous claims, such as claims under tribal attorney contracts, without submission to and approval by the central office. In collaboration with the General Services Administration improvements were made in the procedures incident to purchases made by the General Services Administration for the Alaska Native Service. Studies are continuing to further improve, strengthen, and simplify the accounting requirements.

Bureau of Land Management

Edward Woozley, *Director*

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THE numerous functions of the Bureau of Land Management are directed by a line and staff type of organization. The multiple and complex operations of the Bureau at both the Washington and field levels serve many cross sections of the public through a program of management and disposal of public lands and its resources both renewable and nonrenewable. A survey and reorganization of the Bureau was undertaken during the past year in order to promote efficiency and economy of operation as a bureau and to better serve the public at the "grass roots level."

The revenue from the management of the public lands in fiscal year 1954 was the highest of any preceding year. It exceeded the previous year's collections by over $10,000,000. Income from all sources for fiscal year 1954 was $77,487,000. Of the total amount, $27,232,000 was distributed to States and counties. The receipts were from many sources including the leasing of oil, gas, and other minerals, timber sales, and grazing leases.

Through its basic operations in cadastral engineering, range management, minerals, forestry, and lands, the Bureau of Land Management has made many major contributions to the development and use of natural resources on public lands. Under its jurisdiction are some 180 million acres of public domain in the United States and 290 million acres in Alaska. In addition, this agency is responsible for the leasing of minerals on approximately 700 million acres of federally owned lands and about 50 million acres of privately owned lands in which the United States Government has mineral rights.

Highlights of accomplishments under the Bureau of Land Management's reorganization including general administration, and a review of the work by functions embracing cadastral engineering, lands, range management, forestry, minerals, and international cooperation are given in this report.

REORGANIZATION

Authority.—A survey team to study the organization and operations of the Bureau was appointed by the Secretary on December 18, 1953. Following a detailed study of the Washington office and the field, recommendations were submitted to the Secretary, and on January 26, 1954, the Director was authorized to place these recommendations into effect within 1 year, with the least possible interruption of work and service to the public.

Organization.—The Bureau is divided into the Director's office located in Washington and the field offices. The purpose of the Washington office is threefold, including policy formulation, planning, and executive direction of the Bureau programs. The purpose of the field organization is the execution of the Bureau's programs in accordance with the administrative policies in the most economical and efficient manner to best serve the public interests.

The Washington office was reorganized into the Director's office, his personal staff, and two divisions—one for technical activities and one for operations. The Division of Technical Programs is headed by the Associate Director assisted by the staff officers for each of the functions of lands, minerals, forestry, range management, cadastral engineering, and international cooperation. The functions of personnel administration, finance, administrative services, and land management for the closed land States are the responsibilities of the Division of Operations under the direction of the Executive Officer.

The Director's personal staff includes an assistant to the director in charge of management improvement, docket control and the reorganization procedures, an information officer, and a group of field commissioners to hear appeals for land office decisions.

The field portion of the Bureau has been changed to place service in unified areas of geographic similarity and with more concentration of field personnel at the State levels. The former seven regions have been reduced to four areas, with headquarters as follows: area 1—Portland, Oreg.; area 2—Salt Lake City, Utah; area 3—Denver, Colo., and area 4—Anchorage, Alaska. Activities in the closed land States east of the 96th meridian are being conducted through the Eastern States office in Washington, D. C. This office also handles acquired land cases, and supervises issuance of patents and most of the public land orders as well as activities in connection with the outer Continental Shelf.

A new addition to the Bureau organization is the State office. The State office is the operating office for field personnel for all programs and exercises authority over all other BLM offices in the respective States, which include the land offices, grazing district offices and district forestry offices.

The State offices are located as follows:

Spokane, Wash.
Portland, Oreg.
Sacramento, Calif.
Boise, Idaho
Reno, Nev.
Billings, Mont.
Cheyenne, Wyo.
Salt Lake City, Utah
Denver, Colo.
Santa Fe, N. Mex.
Phoenix, Ariz.

Progress in reorganization.—All area and State offices have been established and key personnel have been assigned. The Washington organization has been approved.

The decentralization of the Washington office caseload work for both lands and minerals has proceeded according to schedule. Some parts of the schedule have been revised in order to assure adequate trained personnel and records in the various field offices. The Bureau has installed a pilot docket system in the Washington office for maintaining a record of cases. This system will later be installed in each of the local land offices.

Land Records.—The survey team recommended an immediate program to preserve, reform, and modernize the land title and use records of the Bureau. The condition of these records has been recognized for some time and considerable work has been done. Basic systems for this purpose are being investigated and tried in order to clarify the fundamentals for a modernized land record system. During the development of this records improvement program, which will require approximately 3 to 5 years under the present program to achieve material results, several interim measures in the interest of security and better placement of records are being taken.

Budget and Finance.—A pilot installation of a decentralized general ledger was made at Portland. Through arrangements with the Department, both the records in Washington and at Portland were maintained concurrently on two bases: accrued expenditure and an obligation basis. The results have indicated that, insofar as this Bureau is concerned, the records need be maintained only on an obligation basis and in fiscal year 1955 the procedures will revert.

Administrative Services.—A strong emphasis is being placed on utilization, maintenance, accurate physical inventorying of property, and the timely disposal of excess property.

Personnel Management

Fruits of earlier recruitment of young professional foresters and range conservationists and others became evident during the year, as many of these men moved into more responsible positions. The success of young professionals who have been with the Bureau less than 5 years proved the wisdom of the Bureau's recruitment policy and indicates the necessity of continuing it along approximately the same lines.

The Fifth Annual BLM Training Conference was held in August at the Tony Grove summer camp of the Utah State Agricultural College near Logan, Utah. Representatives of the college, Congress, the Forest Service, and other Government agencies participated in the program along with 44 selected Bureau employees.

The Bureau continued its participation in management training by selecting three experienced professionals from the field and recruiting one JMA in Washington.

Employment in the Bureau on June 30 totaled 1,748, distributed as follows: Area 1, 433; area 2, 461; area 3, 455; area 4, 149; Eastern States office, 95; Washington office 152, and technical assignments in foreign countries, 12. These figures include 34 legal employees transferred to the Solicitor's office on July 1, 1954.

Reorganization furnished an opportunity to improve placement of a number of employees. The result of the reorganization in general from the standpoint of personnel management should be greater net productivity per personal service dollar. Reshaping of the staff to conform to new or changed organization units was accomplished without the necessity of resorting to reduction-in-force procedures. This was possible because there was a position available for every person on the rolls who was qualified and willing to accept at the location where the position existed.

Additional Accomplishments Under Reorganization

The reorganization and the accomplishments discussed above have been attained during the last half of the fiscal year. With the remaining time to proceed on effecting the complete reorganization, there is still much work to accomplish and many opportunities to effect additional improvements. It is felt that to date the accomplishments have been made with as little distraction and disruption as possible, and that the public has continued to receive improved service with each step achieved. Certain recommendations of the survey team require action by the Department or cooperative efforts with other agencies. These types of adjustments usually require a longer period to be completed because of the more complex situations involved.

CADASTRAL SURVEYS

The Bureau of Land Management is the official agency for conducting the cadastral survey of the public land, including Indian reservations, national forests, etc. The survey work of the Bureau is limited by appropriation to the public lands under its jurisdiction; surveys conducted for other Federal agencies must be on a reimbursable basis. The law permits private contributions to defray the cost of the cadastral surveys in particular instances.

In any program of land management or development it is basic that the boundaries of the lands being administered be definitely known. The Federal Government is no different in this respect than any private or corporate body seeking to improve or develop their own lands. Thus it is that the cadastral surveys of the Bureau are the first step to be taken in the conservation or development of the public lands and their resources under the jurisdiction of that Bureau. Those programs looking toward the conservation of the resources which will prove to be of such tremendous value in future years, such as timber management on a sustained-yield basis, soil and moisture conservation, range improvement, and reclamation, are dependent in large measure upon adequate cadastral surveys as a basis for their development and administration. The transfer of public lands to the several States in satisfaction of their school grants is dependent upon the cadastral survey of those lands for identification and description.

The cadastral survey program of the Bureau of Land Management during the fiscal year 1954 was planned to aid to the fullest extent the conservation and development of the natural resources. The requests for surveys which originate with the other operating functional offices of the Bureau, as well as the States and industrial organizations, are of necessity screened and evaluated in the light of funds and personnel available for the work. Priority determinations are the result of careful consideration of the value of each project in the conservation and development program of the Department as a whole, as well as the immediate use and benefits resulting from those surveys. The 1954 program was balanced to provide for such important activities as the timber salvage operations in western Oregon and California, the survey of areas of high potential or important mineral development, the survey and resurvey of areas where livestock forage will result in increasing the food supply of the Nation as well as those areas especially considered for homesites and housing of the increasing population.

Outer Continental Shelf

An activity of major importance during the year was the result of the passage of the Outer Continental Shelf Lands Act on August 7, 1953. That act provides for the leasing of areas on the outer Continental Shelf for development of the mineral resources underlying the seas. Those resources are notably oil, gas, and sulfur. As the result of the passage of that act, there devolved upon the cadastral engineering organization the need for means of describing suitable areas for leasing and the definition of the boundaries of those areas. The initial activity was confined to the outer Continental Shelf in the Gulf of Mexico offshore from the States of Louisiana and Texas. In that area approximately 400 leases had been issued by the States which might be subject to confirmation under section 6 of the act. There was considerable interest shown in the leasing of additional ocean bottom in this area for exploration and development of the oil and gas deposits with resultant increase in the known reservations.

In order to accommodate this interest and provide the base for leasing the area, the existing scheme of description, based upon coordinate values as adopted by the States of Louisiana and Texas for limited areas in comparatively shallow waters, was expanded and extended on the outer Continental Shelf to the limit of what is considered practical for development by present methods of drilling in the deep waters. Leasing maps, covering approximately 12 million acres on the outer Continental Shelf offshore from Louisiana, were completed during the year and a good start made on similar maps covering approximately 8 million acres on the outer Continental Shelf offshore from Texas. This phase of the cadastral program in itself will afford the basic data necessary for description and location of areas which are expected to produce great volumes of petroleum products for many year to come.

Surveys in Continental United States

The public land statistics reflect that there are some 100 million acres of unsurveyed public domain in the 11 Western States. Considerable portions of that great unsurveyed area lie within national forests or other permanent reservations where there is no present urgent need for the surveys. On the other hand, there are very extensive unsurveyed areas, particularly in Utah, Arizona, and California, where the public-land survey net should be extended for identification of school lands, for development of mineral resources, and to provide the basic data necessary for administration and development of the lands to their full potential.

Our public-land survey program was initiated in the Western States more than a century ago. In many of the older surveys the corners were not monumented with such permanence as to withstand the ravages of the elements and the destructive forces of man's machinery. There are millions of acres of public land in these Western States, to which title is still in the Federal Government, which are in urgent need of resurvey to provide for the recovery and remonumentation of the corners and the remarking of the boundary lines for the proper development and useful conservation of the resources of those lands.

In the cadastral survey program for the year 1954 there were approximately 1,320,000 acres of land. Included in that program was the continuation of such important and essential work as identification of lands for the development of uranium deposits; the surveys necessary for control in development of mineralized areas; and for the determination of boundaries of valuable timbered lands under the jurisdiction of this Bureau. The program of surveys for identification of school lands was expanded on a plan designed to limit the surveys to the boundaries of the townships involved and the particular school sections in those townships, all as a basis for securing title to those lands in the States involved. Additionally, the program encompassed the surveys and resurveys of lands required for determination of boundaries of public domain forest land areas, for proper management of those resources, and for the management and improvement of grazing lands to improve forage capacity. Also included in the program was the survey of approximately 17,000 acres of small tracts to provide homesites in areas of population growth in the Western States and also for vacation homesites in those States and Florida. Miscellaneous surveys and investigations involving waterfront areas to determine the ownership of the lands were carried on to completion during the year.

The program also included the resurvey of extensive areas within various reclamation projects, such as the Missouri River Basin Development and the Colorado Big Thompson project. Those surveys included many miles of reservoir boundaries and rights-of-way traverses in addition to the surveys strictly on an area basis.

Alaskan Surveys

The field program carried forward in Alaska was planned to meet the most urgent demands. The program was carefully developed in the light of available funds. Less than 1 percent of the vast area of Alaska has been surveyed and it must be recognized that the expanding developments of the Territory points to the need for acceleration of the surveys.

The program for the year just ended resulted in the survey or resurvey of approximately 22,000 acres of land under the rectangular survey net, as well as the survey of 28 homesites and homesteads; two trade and manufacturing sites, and two Indian allotments. In addition, a total of 1,789 small tracts, 327 town lots, and 162 lots for the Alaska Public Sale Act were surveyed, thus making available land for that many homes and homesites in areas of the greatest development.

Protraction maps were prepared to provide a basis for lease descriptions on an extensive area of unsurveyed land in the Yakataga-Katella area. These lands are considered to be valuable for oil and gas deposits and one of the major companies was engaged in prospecting operations in the area at the close of the fiscal year.

The future development of Alaska will be aided by the extensive program of survey work completed during the year. While that program is large, it must be recognized as but a fraction of that which is needed.

LANDS

New Legislation

Legislation passed during the year will facilitate orderly disposition of public lands suitable for use by various classes of individuals and agencies. It will also obviate the need for special legislation in many individual matters which ordinarily arise year by year.

Among the more important of the new laws was the passage of a thorough-going amendment of the Recreation Act of 1926. The new law, enacted June 4, 1954, permits the Secretary to dispose of suitable lands by lease or sale to agencies and instrumentalities of Federal, State, and local governments and to nonprofit corporations and associations for use of all types of public purposes. The act also applies to public lands in Alaska, as well as in the States, and exempts very few classes of withdrawals and reservations from its terms. It is a broad-gaged tool which will permit the dedication of special-purpose lands to their appropriate use. Authority for processing action under the law will be delegated to the Bureau's local officials to permit prompt and effective realization of the objectives of the legislation.

The extension of veterans' preference by the act of June 18, 1954, confers on veterans of the Korean conflict all the rights and privileges of the Veterans' Preference Act of 1944 and extends the preferred right of applications by both World War II and Korean veterans until 1959. A basic modification of the previous practice is the requirement of cultivation of one-eighth of the lands by veterans in their homestead entries before patent for the lands can be earned. This change will be of particular importance to the development of Alaska where the former waiver of cultivation requirements had led to substantial amounts of absentee ownership and to large areas of patented but undeveloped agricultural lands. The new law favors bona fide farming attempts and discourages appropriation of lands for purposes other than agriculture. In the past, homesteading by veterans was often to the detriment of other applicants in good faith for such lands. Revision of the law will expedite land and resource disposal programs in the Territory.

The amendment of the Small Tract Act on June 6, 1954, will also lead to a more effective disposal program, particularly in Alaska. The amendment extended the act to unsurveyed lands and the O. and C.

lands, and permits the lease and sale of small tracts to corporations, associations, and governmental units as well as to individuals. Broadening of the terms of the law gives the flexibility needed in the disposal of small areas useful for residence, business, recreation, and community purposes.

A long-standing inequity in respect to school lands was ended with the signing of an act by the President on April 22, 1954, which granted the States mineralized school sections even though they were covered by an outstanding mineral lease or permit. In 1927 Congress granted the States mineralized school sections but excepted those under lease or permit at the time of survey. States' title then depended on the accidents of mineral prospecting. The remedial legislation corrects this situation by passing title to the lands to the States for use for their common school system and by transferring to the States all rights of the United States in leases or permits in force on such lands.

Improvements in the color-of-title law were made by the act of July 28, 1953, which simplified and unified the existing law. Patents may now be issued for claims of long standing, under certain prescribed conditions, without reserving minerals to the United States. Payment of taxes on the land during the period beginning prior to 1901 is now a basis for favorable action on a color-of-title claim.

Withdrawals and Reservations

The Department's and Bureau's drive to revoke unnecessary withdrawals of land reserved for public purposes and to reduce and modify unnecessarily restrictive withdrawals gained momentum during the year. Revocations totalling 1,777,000 acres, of which 1,181,000 acres were in Alaska, were published. At the end of the year, several million acres were in various stages of processing for ultimate revocation.

Through the cooperative efforts of the Bureau, the Geological Survey, and the Department of the Navy, the results of years of Government sponsored oil and gas exploration and testing in northernmost Alaska were placed on open file. Plans have been well developed for opening the lands outside the Naval Petroleum Reserve in that area for development under the Mineral Leasing Act of 1920. In order to give the interested public full and equal opportunity to assess the results of the exploration to date, the information was placed on open file well in advance of the date of opening.

During the year, new procedures for proposals of new withdrawals were fully instituted. All applications for withdrawal are publicized upon receipt by the Bureau of Land Management and public hearings are held when the nature of protests as the result of publication or other circumstances warrants it. Several hearings were held during the year at which the objectives and disadvantages of proposed withdrawals were publicly discussed. The hearings proved valuable in bringing out essential facts needing recognition in decisions in each case and permitting adjustment between national needs and local requirements.

Important modifications during the year included the opening of the Carlsbad area, New Mexico, to oil and gas leasing and the Mantanuska Valley, Alaska, to coal leasing.

New withdrawals during the year were relatively minor in scope except for the withdrawal of 1,178,000 acres in Utah and Arizona for the Colorado River storage project. The latter lands were opened to mining location and development until needed for the reclamation project.

Efforts during the year thus resulted in freeing additional resources for development while providing at the same time for the legitimate needs of the various Federal and State action programs.

Applications for Land

Receipt of applications during the year continued at an accelerated pace. New work received by the Bureau increased 50 percent over the preceding year, which in turn had set a record for recent years. Chief cause for the even higher rate of applications is the steadily mounting interest in small tracts. Applications for leases and for sales of small tracts both about doubled the previous year's intake. Applications for other types of land disposals or permitted use continued at a fairly steady pace except for desertland entry applications. Applications for this latter type of case dropped to about 50 percent under those received in the fiscal year 1953, indicating perhaps that the peak has been passed in the efforts to reclaim certain classes of desert basins by development of underground water supplies. Experience gained in the past few years and changing conditions, including increased costs of production and somewhat lower agricultural commodity prices, may be important factors in this trend. On the other hand, the joint Bureau of Land Management-Bureau of Reclamation program for revocation of unneeded reclamation withdrawals has been making available some areas for entry under the public land laws.

Work completed during the year exceeded by about 50 percent the work done in 1953. The constant acceleration of new work, however, defied all efforts to make inroads into the backlog of pending cases. This has been the experience of the Bureau each year since the beginning of the Korean conflict. Improved production was realized for most classes of cases, yielding net gains in some fields. The heavy loads in small tracts and withdrawals and reservations, however, offset the improved conditions of other phases of the work.

Organization and Procedures

By the end of the fiscal year, reorganization of lands activities was close to completion. Staff and operating responsibilities were clearly separated and practically all lands operations were transferred to field operating officials. Adjudication, classification, and examination activities were centralized in State offices to permit close coordination and direction of the work and closer contact between applicants and Bureau personnel.

Staff personnel, freed from operating duties, were able to make a substantial beginning on organizing and modernizing the materials which govern operations, including policy statements, manual procedures, and regulations. Owing to the multiplicity of public land laws and the endless variety of situations which arise in individual cases, rationalized and simplified guide materials, although difficult to produce, are highly essential to efficient operations. For example, present regulations are largely the results of annual accretions over many years. Consequently, they are difficult to operate under and obscure to public land applicants. A program was started looking to the complete revision, including reorganization and simplification of the regulations dealing with land disposals, such as homesteading, exchanges, and veterans' rights and privileges.

Land Classification

During the year, considerable advances were made in the Bureau's program of area land classifications. The major objective of area classification is economy in operations through the consideration of all the land-use factors affecting an entire geographical unit, usually a small sub-basin. This overall consideration permits assessment of all values and results in information which allows action on all types of applications on hand or when received. Most area classification work of the Bureau, owing to the great influx of applications, is done in response to demand for land from applicants. However, the Bureau is participating in two large interagency classification programs in the Missouri River Basin and in the Arkansas-White-Red Basin.

Land classification work in the Missouri River Basin is well advanced and is more than half completed. Several disposal areas have been delineated in which a Bureau program of land disposal on its own motion is being started. Thousands of acres, consisting largely of relatively small, scattered parcels will be placed in private or local government ownerships or under other Federal administration in the coming months. Several major land-pattern adjustment programs are underway for the simplification of administrative control of lands among Federal and State agencies. Important data for land treatment measures needed in connection with water developments in the Basin are also being secured and action programs initiated.

Bureau studies in the Arkansas-White-Red River Basin involves land in eight States. Most of the land, however, is concentrated in southeastern Colorado. Information to date has disclosed that much of the land outside of Colorado is suitable for disposal. As a result, the forest classification withdrawal in Arkansas has been lifted in part, and upon completion of the classification the remainder will be revoked. An accelerated program of forest-land classification in the Eastern States has been initiated. Most of the public lands in the States east of the Mississippi cannot be managed economically by the Government and will be disposed of. Institution of a program of area sales has stepped up the disposal program and procedure. Classification will be completed as rapidly as possible to permit the Bureau to make its full contribution of information necessary for the formulation of an integrated water development program for the region.

Area classification has been a particularly useful tool in dealing with concentrations of applications in areas of fringe developments, such as isolated desert basins and suburban zones. Examples of such small-area classifications follow.

Chuckawalla Valley is a desert basin in Riverside County, California, containing about 300,000 acres. About 450 desert-land applications were filed for lands in the valley. Investigations showed that the Valley has no perennial streams and that the ground-water supply is primarily dependent upon a small percent of annual precipitation which reaches the permanent water table. Although about 64,000 acres were found suitable for cultivation after proper land treatment, the indicated water supply seems sufficient for crop production on a sustained basis only on a small portion of the total arable acreage in the undeveloped valley. Therefore, 28,000 acres were designated as best suited for development because of type of soil, slope, and low cost of land preparations.

In the Raft River area, Idaho, a study of the land capabilities in the area by the Bureau and the issuance of a report by the Geological Survey on the groundwater resources indicated additional agricultural development was feasible. Accordingly, some 10,000 acres were allowed under the desert-land act and it is expected that this land will soon be in agricultural production.

Thousands of small-tract applications have been filed in the vicinity of Las Vegas, Nev., particularly in the neighborhood of the now famous resort strip of that community. Area studies resulted in the classification of a large amount of acreage for small-tract purposes. The investigations included careful study of the groundwater supply situation which was necessitated by the fact that the Bureau must take action not only on many small-tract applications, but also on completing applications for the same lands by applicants for desert-land entries, exchanges, and other disposals.

Studies in the Waterman Wash area, Arizona, showed that 3,500 acres were under irrigation in the valley. With a water duty of 5 acre-feet per annum, consumptive use was calculated to be in excess of the annual recharge to the groundwater reservoir by seven and one-half to eight and one-half times. Allowance of the pending 116 desert-land applications would threaten such development as exists. By contrast is the action taken in the nearby Rainbow Valley, which further exemplifies the decisions based on the merits of the area involved. A current overdraft of available water supply was found but the data obtained indicated that an allowance of a few more entries would not result in any appreciable effect on existing farms.

A total of 32,000 acres of public domain in Guadalupe County, N. Mex., was classified on an area basis. The county is located in the east central portion of the State and most of its 2 million acres are range forage lands. Examinations showed that the 334 tracts of public domain in the area could be best used and managed in non-Federal ownership and they were classified as suitable for disposal upon application. Other area classifications encompassed a variety of land-use situations calling for adequate data to be interpreted by sound judgment. In addition to these area classifications, a large number of individual cases and groups of such cases were examined and classified during the year.

RANGE MANAGEMENT

Importance of the Public Lands to the Western Range Livestock Industry

The public lands administered by the Bureau of Land Management generally are more suited for grazing purposes than any other surface use. They contribute in a major degree to the total forage requirements of the western range livestock industry. Consequently, the continued welfare of this industry is dependent upon the balanced and complex integration of land use involving the total area of the range and all classes of land ownership. Within the range country there are limited irrigated areas devoted to specialty crop production, but the backbone of the agricultural economy over extensive areas is the livestock industry. Supplemental forage produced on irrigated land depends on water supplies from high mountain watersheds. These same watersheds produce valuable livestock forage for summer use but do not yield sufficient water to produce the remainder of the annual forage requirement of the livestock on the cultivated lands lying below. The great significance of the public lands administered by the Bureau is due in part to their watershed values but most significantly they provide spring, fall, and some winter grazing and thereby round out the annual forage requirement of dependent livestock operations.

During the past year permits and licenses were issued to approximately 19,100 stockmen, authorizing their use of the Federal range within the 59 established grazing districts. These authorizations allowed the grazing of 8.8 million head of livestock for about 35 percent of their annual forage requirement. Included were 2.5 million cattle, 59,000 horses, 6.3 million sheep, and 15,000 goats. Outside of grazing districts 17.9 million acres were under grazing lease to 9,800 stockmen.

Range Administration Program Intensified

The grazing administration function of the Bureau is accomplished by a limited staff involving a total of 245 technicians and clerks. Due to the reorganization of the Bureau, the nature of the duties and functions carried out at the grazing district level have been sharply defined and made more practical in scope. Full attention has been placed upon range privilege adjudication activities, range development and conservation work, range condition and trend studies, and range-use supervision.

The top priority activity for the past year has been the adjustment of grazing obligations on the Federal range to the available and proper grazing capacity. This activity has been carried out through the reappraisal of range privilege adjudications and stocking of the range with the consequent elimination of unqualified demands and improper management practices. The reappraisal includes rechecking dependent property surveys and resource surveys by permanent and seasonal employees, but was restricted by appropriation limitations. Coincident with the adjustment of obligated use to grazing capacity is the formal reservation of forage for big game animals, made in accordance with the availability of forage and the suitability of areas as wildlife habitat in order to arrive at a proper domestic livestock-wildlife balance.

The range administration activities are directed toward having over 90 percent of all range users under term permits. This goal cannot be reached in 1 year, but can be attained in a few years barring unforeseen difficulties.

Supplemental to this activity and of high priority has been the initiation of range condition and trend studies to acquire accurate information with which to justify administrative actions. Lack of information of this nature has been one of the principal weaknesses of the Bureau's range administration in the past. An increasing participation in the studies of range users is anticipated.

With the staffing of grazing districts at the prescribed level, range-use supervision has been better and more intensive than at any time since the Federal range was brought under regulation. The activity in this connection has been to make range-use inspections according to regularly scheduled plans during the appropriate season to cover critical administrative units.

The effort to lease all section 15 lands in retention areas has continued. Through consolidation of leases held by operators having more than one lease, considerable duplication of record keeping and administrative actions, and confusion to lessees is being eliminated. Transfers in administrative headquarters have brought about more adequate administration and ease in supervisory activities.

Range Conditions

The drouth conditions of a year ago in large portions of the Southwest have continued with little abatement. Supplemental feeding under the emergency drouth relief program was carried out generally during the past year over the drouth area. In southern Wyoming, most of Colorado, and much of New Mexico and Arizona feed conditions were poorer than the peak of the drouth cycle in 1934. The lower ranges of Nevada and Utah have had very scant forage, and supplemental feeding of livestock during the coming fall will be a necessity in many areas. Prospects for the coming winter season are equally poor in the drouth areas, since a mild winter and dry, cold spring curbed normal forage production. Voluntary stocking adjustments and widespread supplemental feeding is anticipated.

Northern ranges in the western public land States are in normal or near-normal condition due to late spring rains. Some localized areas did not benefit from these rains and forage production is materially below average.

Wildlife Management

Sheeptight fences.—In recent years a wildlife management problem has developed in Montana and Wyoming resulting from the construction of sheeptight fences on public ranges that are utilized by antelope. These fences have been constructed as a better pasture management device and to reduce the necessity for so many herders. A more effective predator control has lessened the hazard of sheep running loose in pastures without the constant protection of a herder. However, local and national wildlife groups have been seriously concerned about the fences because of the belief that they denied antelope access to their more favored seasonal ranges when the fences crossed migration routes or enclosed water supplies.

The Bureau of Land Management and the Fish and Wildlife Service the past year completed a joint study of this sheeptight fence problem as it relates to the welfare and management of antelope on the public domain in Montana and Wyoming. The study provided the information needed for the development of suitable fencing on areas of public domain to meet the requirements of the livestock interests and at the same time protect the public interest represented in the antelope and other wildlife resources. Specifications on fencing, such as openings or drop gaps, height of wires, and the suitability of woven wire in certain places are now being developed and will serve as general criteria for fence construction. Local problems may require special consideration in regard to fencing specifications.

Determination of Grazing Capacity for Game Animals.—The cooperative range resource survey of the Fort Peck game range in Montana has been completed recently by the Fish and Wildlife Service and the Bureau of Land Management. A method was devised and used for rating this range for both livestock and big game separately, and for dual use where the range was subject to complete use by game and livestock.

The value of this approach lies chiefly in that a reasonably accurate determination of excess grazing capacity available only for game can be determined and made a part of the management plan. Secondly, forage reservations for either livestock or game can be made on a realistic basis and a conversion from one class of use to another can be made on the basis of what a particular forage type will produce in the way of either livestock or game feed. This new method of forage resource surveys is considered one of the outstanding land-management developments in recent years and will serve as the basis for attaining proper livestock-wildlife balance on problem areas in the future.

Soil and Moisture Conservation

Progress was made during the year in the revised programming of this activity by watersheds. A large number of approved soil and moisture conservation areas were consolidated into subbasins of major western rivers, extending the area covered by the program to all Bureau lands within the watershed. Long-range conservation plans projected over a 20-year period in line with the Department's overall conservation program are under development for all subbasins.

An increase in appropriations permitted the concentration of project funds for complete watershed protection in individual watersheds or segments thereof. This approach results in a more effective program and a more efficient use of funds. Outstanding examples of accomplishment in watershed protection during the past year include Railroad Wash in eastern Arizona and tributaries of Willow Creek in northern Montana. The total area of Bureau lands receiving conservation practices during the fiscal year exceeded 650,000 acres.

The Bureau's achievements in conserving soil and water through the practice of range waterspreading attracted international attention last fall. (See figure 1.) Under the sponsorship of the Foreign Operations Administration, the Bureau, assisted by other agencies, conducted a 90-day training tour of waterspreading and other range conservation projects in the west for a group of leaders from Middle East countries. In this connection Bureau technicians collaborated with other Federal agencies in the preparation of a technical manual on waterspreading for use in training foreign technicians in this practice.

Bureau technicians also won the approbation of the Corps of Engineers for watershed protection work in the Southwest as an effective aid to downstream flood control.

The program of pilot soil conservation districts in public land States developed in cooperation with the National Association of Soil

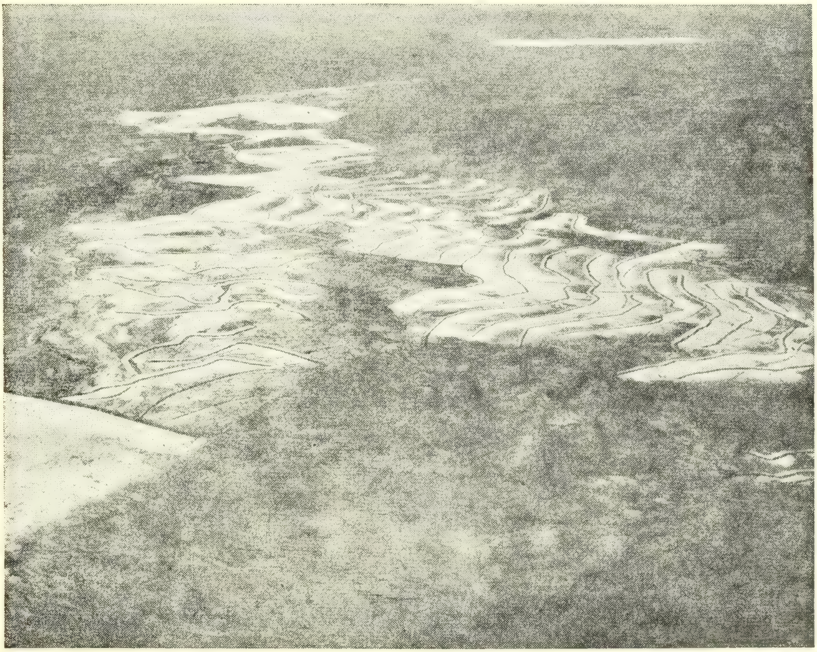

FIGURE 1.—Range waterspreading project on a tributary of Willow Creek in northern Montana. This project has been constructed at the confluence of two minor streams and is shown in full flood stage.

Conservation District Supervisors moved ahead with integrated conservation plans now completed for 11 pilot districts. The rancher-supervisors of the Northeast Elko pilot district in Nevada took sufficient pride in the accomplishments in their district to produce a color-sound motion picture of conservation progress. The picture, which generously commends Bureau cooperation, has been released for nationwide showing through 2,500 local soil conservation districts.

Halogeton Control

Surveys of the poisonous range weed, halogeton, have revealed the area of infested Bureau land to exceed 4 million acres, an increase of almost three times the area previously reported. Most of the increase has resulted from an intensification of sparse infestations and a coalescence of scattered areas. Invasion of new range areas has been slight and has been held in check by control work.

Continued emphasis in control operations was placed on the seeding of infested and threatened ranges to hardy perennial grasses. Approximately 125,000 acres of rangeland were seeded in fiscal year 1954 bringing the total area seeded since the program was started in 1952 to about 325,000 acres. An additional 25,000 acres have been prepared for fall seeding in 1954. An unusually high degree of success has been obtained thus far in the seeding program despite generally unfavorable climatic conditions. (See figure 2.) For the most part, the success can be attributed to good seedbed preparation and careful seeding methods aided by timely though scant precipitation.

Successful seedings in all cases are eliminating halogeton or reducing the volume present below critical amounts. As the grass becomes better established with maturity, it is anticipated that halogeton can be excluded altogether and reinvasion prevented excepting in stand openings caused by soil deficiencies or other factors. Some of the earliest halogeton control seedings will be ready for grazing use in the fall of 1954 and spring of 1955 thereby relieving use on surrounding rangeland unsuited for reseeding. The full influence of the reseeded ranges on the halogeton problem will probably not be known for several years. In the meantime, the Bureau has undertaken a systematic evaluation of the control methods now used with the assistance of specialists from other agencies. The principal objective of the evaluation is the improvement of present methods as means of developing more effective control programs. The use of chemical sprays in the control of halogeton was confined to infestations bordering major transportation routes and isolated spot infestations. Most of the chemical work was carried out in cooperation with State and county weed-control agencies.

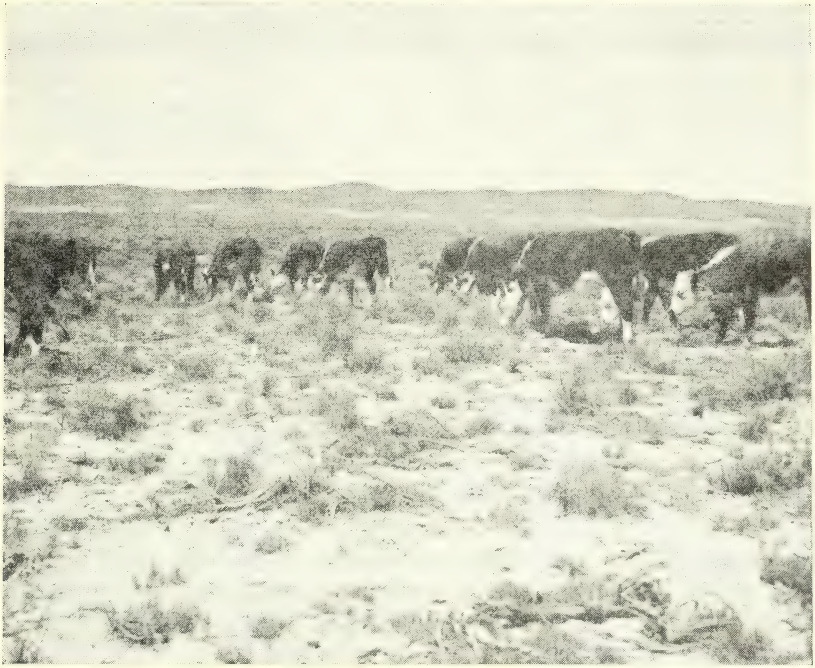

FIGURE 2.—The LaMoille reseeded range pasture near Elko, Nev., has been under managed use for several years. It is representative of hundreds of thousands acres of depleted rangeland that have been reseeded in recent years.

Of special importance to the halogeton control program is the development of basic information on the life history of the plant and methods for its control by research agencies. The Bureau has been participating in and supporting a coordinated halogeton research program with the United States Department of Agriculture and several land grant colleges. The investigations now underway are beginning to yield vital facts on a hitherto little known plant that are essential to an effective control program.

Range Improvements

The continued severe drouth affecting much of the range country has resulted in a departure from range improvement plans in order to meet local emergency conditions. Water development has received prime emphasis in the drouth areas with other planned improvements deferred until some future date. Elsewhere the construction of division and allotment boundary fences received the major emphasis. Fencing under all range programs is now proceeding at a rate of about 750 miles each year resulting in better management of the range and better control of trespass livestock.

As usual during periods of drouth, insect pests have reach serious outbreak proportions in some areas. Effective control measures during the 1953 season reduced Mormon cricket infestations to an almost harmless level. On the other hand, there was a rapid buildup of grasshopper infestations reaching a total of almost 900,000 acres of Bureau lands. A cooperative control program has been organized under the leadership of the United States Department of Agriculture in which the Bureau and range users have participated.

Legislative Highlights

Major legislation enacted by the 83d Congress affecting range management functions is as follows:

Public Law 375.—Amended the Taylor Grazing Act by authorizing the Secretary of the Interior to grant an appropriate preference right to range users, on lands restored from withdrawal, for a grazing lease, license, or permit when these livestock men have used the lands immediately prior to the time of restoration. In addition, and of major importance, the new law deleted the language of the Taylor Grazing Act which limited the area of public domain in grazing districts to 142 million acres. Lifting of the limitation will allow the addition to districts of the relatively small areas of remaining public domain suitable for incorporation into districts.

Public Law 387.—Amended the Recreation Act of 1926 by providing for the sale or lease of public domain up to 640 acres in any one year, to nonprofit organizations if the Secretary of the Interior agrees with the recreational purposes for which the lands are to be conveyed or leased.

Public Law 524.—Authorized the Department of Agriculture to cooperate with local organizations on watershed protection and improvements. The Secretary of the Interior is authorized to cooperate in these conservation programs on watersheds, public lands, or irrigation projects.

Public Law 566.—Provided for the transfer of surplus seed held in storage by the Commodity Credit Corporation for reseeding public lands.

Accomplishments to be expected in the coming year will center around the intensified range administration activities, programming soil and moisture conservation on a watershed basis, and a very active weed control program. Significant strides will be made toward reaching the ultimate goal of having in excess of 90 percent of all range users under term permit. Substantially complete realignment of soil and moisture on a watershed basis will be brought about. More effective halogeton control is expected through the application of results of a systematic evaluation program and research findings from the several land grant colleges and the Department of Agriculture. It is anticipated that 700,000 acres of public range land will receive conservation treatment, including:

125,000 acres—range reseeding; 12,000 acres—waterspreading; 800 miles—range fencing; 30 major erosion control structures; 250 stock waters.

FORESTRY

Timber Sales

The volume of timber sold from Bureau forest lands in fiscal year 1954 was the greatest in the history of the Bureau. However, the sale value of this timber, reflecting the drop in lumber market during the year, was not so great as the preceding year's sale values. The volume sold in fiscal year 1954 and the sale value are [1] 696,115,000 board feet of timber and $12,627,521, respectively. This is in contrast to volume and value of the 1953 fiscal year in which 653,714,000 board feet of timber valued at $13,836,540 were sold.

Timber from the Oregon & California Railroad and Coos Bay Wagon Road grant lands accounted for [1] 618,900,000 board feet of the total sold and $11,572,788 of the total value of such sales. Public domain timber sales accounted for the remainder or 77,215,000 board feet of timber valued at $1,054,733.

The revenue received by the Bureau from the sale of timber is many times the appropriations made for all phases of timber management on all Bureau lands. Even with a substantial amount of the income turned over to the various counties and States in lieu of taxes, the return to the Treasury from these forest resources is a substantial sum each year over appropriations. This "profit margin" is proof that good forest management pays.

Timber Sale Plans

On O. & C. and C. B. W. R. grant lands, the act of August 28, 1937 required that the forests be managed in accordance with the principles of sustained yield. In the beginning years of selling timber under these principles, sales were made largely in response to applications. This method of timber sales meant that the Bureau was constantly under pressure from someone wanting a tract here and someone else a tract there. The industry, depending on purchasing O. & C. stumpage, never knew until the formal advertisement appeared where the next sales would be located.

To build up an effective forest management program, a more positive approach was needed, an approach with the Bureau taking the initiative in the selection of timber sale areas rather than the industry leading the Bureau. To accomplish this objective, timber had to be sold according to a plan.

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[1] Includes trespass settlements.

Each year, now, the logging industry is requested to submit suggestions to the Bureau for tracts of O. & C. timber lands to be offered for sale the following year. These suggestions are studied, and when not incompatible with the Bureau's long-term forest management program, are included in the following year's sale plan. Where no suggestions have been received from the industry, or where the acceptable suggestions do not take the full allowable cut for any area, the Bureau supplements the suggestions with tracts of its own choosing in order that the full cut may be made. When the plan is completed, the plan is given wide distribution to interested persons and organizations. Once the plan has been accepted and advertised, the Bureau adheres to it insofar as is possible. The only reasons for making any alterations would be when conditions for sale had materially changed since the time the plan had been developed, as for example when necessary to sell salvage timber following a fire.

The results of selling timber following such annual timber sale plans have been favorable. Bureau personnel can now intelligently outline their work in advance and follow definite work plans. Industry now knows in advance the tracts of O. & C. timber that will be offered for sale and is thus enabled to make intelligent plans for timber acquisitions. For some areas it is hoped that 3 to 5 years timber sale plans will eventually be placed in operation with added benefit to both the Bureau and industry.

Timber sales on public domain areas are generally so widely scattered that a published plan would have limited value to the lumber industry in the areas affected. Therefore no sale program similar to those of the O. & C. districts is practical. To supplement application for public domain timber the Bureau, where possible, takes the initiative in selecting timber to sell, such selection of areas being based on the Bureau's own long-range timber sale plans.

Timber Salvage

In the past 4 or 5 years, particularly in 1951, winter winds of hurricane velocity have uprooted many trees in the Douglas fir region of western Washington, Oregon, and northern California. In addition to windstorms, fires have also taken their toll of timber in this area. The total volume of timber killed by all causes is estimated to be in excess of 3 billion board feet on the O. & C. grant lands alone. On other lands with which the O. & C. lands are intermingled there is probably 6 billion board feet additional.

When Douglas fir trees are freshly killed, the cambium layer under the bark provides an ideal breeding place for the Douglas fir bark beetle. The millions of freshly killed trees in this region have thus provided such favorable conditions for these beetles to reproduce that the beetle population has swelled to epidemic proportions. With the beetles present in the forests in such numbers, the dead trees alone do not offer sufficient breeding ground, thus green trees are heavily attacked and soon die, adding to the forest toll. Throughout the forests, increasing numbers of red topped, dying trees indicate the extent of the beetle epidemic.

The only practical means of controlling or minimizing the depredations of the bark beetle is to log infested timber and remove it from the forest in order that it may no longer serve as a breeding ground for the beetles. This job is being done as rapidly as funds for access roads and the necessary personnel will allow. During the past fiscal year, 340,263,000 board feet of salvage timber were sold for $6,317,642. Hundreds of millions of board feet of timber will be completely lost through deterioration before the present beetle epidemic has run its course. Much of the damage occurs in isolated pockets of timber which are too small in volume to be ecomonically removed. Of the salvable volume, the job is now estimated to be 60 percent complete.

Forest Land Inventory

One of the most elementary components of any land management program is an inventory. Forest land management is no exception. On the O. & C. and C. B. W. R. grant lands, where forest management has been developed to a high degree, forest inventories likewise have been developed to a high degree.

The first inventory on the O. & C. and C. B. W. R. properties was made in the period 1916–19 for the purposes of classification as required by the Revestment Act of 1916. Another inventory was made of the O. & C. lands in connection with the nationwide forest resource survey of the 1930's. A third inventory partially covered the lands following the passage of the 1937 O. & C. Act, which provided for the classification of the lands according to their highest use. Although none of these inventories, with the possible exception of the latter, was entirely suitable for use in forest management, it was possible by making adjustments to use part of the data from each to provide a usable base on which to build rough management plans. The first forest management plans for the O. & C. lands were of this type.

Shortly after the close of World War II, plans for an intensive up-to-date inventory of the grant lands were made. The time-honored method of ground cruising for making the inventory was discarded in favor of the then new method based on the use of aerial photographs.

In the use of photographs for forest inventory purposes, each photograph is studied individually with stereoscopic equipment, and the various forest type classifications are delineated thereon. Any questionable photo interpretation is checked in the field. Upon the completion of the classification of forest types, the volume of the merchantable sawtimber in the stand is determined by random sampling.

About 22 percent of the O. & C. lands have been inventoried to date, under standards necessary for present-day forest mangament, and another 27 percent of these lands are currently being worked on. The overall inventory project on O. & C. lands calls for completion in fiscal year 1959.

The results of the inventory have been noteworthy. The volume of merchantable timber found in the areas where recent inventories have been made has been 20 to 40 percent greater than the estimates provided by the older inventory surveys. The allowable cut, based on the productivity of the forest soils as well as the volume of mature timber and the acreage of immature forest stands, has also been found to be higher than previously computed. This increase averages about 25 percent overall. If the same upward trend of volume and allowable cut holds throughout the entire inventory, the total volume of timber on the O. & C. and C. B. W. R. grant lands may well be found to be upwards of 50 billion board feet and the allowable cut more than 750 million board feet per year.

Controverted O. & C. Land Question

In 1866 the O. & C. Railroad was granted all of the unoccupied odd-numbered sections of land in a strip 20 miles on either side of its right-of-way. An additional 10-mile "lieu selection strip" on either side of this "in place grant" was set aside as an area in which the railroad could select lands, acre for acre, to compensate for the lands previously settled within the "in place" grant.

At the time the O. & C. grant lands were revested in the Government in 1916, certain lands which lay both within the "lieu selection strip" and national forest boundary were unsurveyed. As rapidly as these lands were surveyed the title to the odd-numbered sections would have passed to the O. & C. Railroad had that company not lost its right to the grant lands. The Department of the Interior, under whose jurisdiction the revested O. & C. lands were placed by Congress, claimed these unpatented lands in the "lieu selection strip" as O. & C. lands. The Forest Service also claimed the lands in the "lieu selection strip" as national forest lands. From this jurisdictional disagreement the lands in dispute became known as the controverted O. & C. lands.

By mutual agreement between the two agencies of the Government, the administration of the controverted O. & C. lands has been done by the Forest Service. Income from the land has been impounded in a special account in the United States Treasury pending a decision on jurisdiction, either by the courts or by congressional action.

During the last year both the courts and Congress declared these lands to be O. & C. lands with the income, both past and future, to be distributed as is the income of other O. & C. lands. The sum of money now held in the O. & C. controverted land account is $7,734,714, of which the counties in which the O. & C. grant lies will share 75 percent or $5,801,036.

Even though these lands have been declared to be O. & C. lands, Congress placed the future administration of them under the jurisdiction of the Forest Service, thereby giving that agency control over a solid block of Government timber lands. To facilitate administration and accounting, Congress further authorized the Forest Service to block these controverted O. & C. lands in each county by designating some national forest lands as controverted O. & C. and some controverted O. & C. as national forest lands, thereby eliminating the intermingled pattern of land classification.

Congress further instructed the Forest Service and Bureau of Land Management to exchange an additional 500,000 acres of intermingled national forest and O. & C. land within the next 2 years. The purpose of this part of the law is to remedy the overlap of jurisdiction of the two agencies over land in the same general area. It will also improve the management efficiency of both agencies and reduce the public confusion that has arisen in the past from differences in the management rules and practices of the two agencies operating in the same area.

Coos Bay Wagon Road Grant Land Reappraisal

Under the provisions of the act of May 24, 1939, the counties of Coos and Douglas in the State of Oregon are paid the equivalent of taxes on the reconveyed Coos Bay Wagon Road grant lands which are located in each county. Such payments are based on the same tax millage rates that are applied to the intermingled private lands; however, the valuation of the grant lands which carry this millage rate is established by a committee appointed by the Secretary. The first appraisal committee completed its work in 1939 and for 10 years the payments to the counties were based on this appraisal.

At the request of the counties in 1947, a new appraisal committee was appointed for the purpose of making an up-to-date appraisal. An appraisal was made for the committee by the inventory section of the Bureau's Northwest region. This appraisal was based on data obtained through use of large-scale aerial photos and was checked in the field for accuracy.

This appraisal, just approved, established the appraised value of the Coos Bay Wagon Road lands at $883,966.00. In contrast, the appraised value of these lands, as established from the 1939 appraisal adjusted for depletion of timber by cutting to the year 1951, is $710,078.31. With the raise in the assessed value, the two counties involved will receive an increase in tax receipts from these lands of approximately 25 percent. The values cited here are the values used for tax assessment purposes and should not be confused with the true market value which would be considerably higher.

Delegation of Authority

Delegations of authority in connection with the reorganization of the Bureau have aided immeasurably the administration of the forest lands of the Bureau, particularly in the forest districts. The district foresters are now authorized to take more final actions on timber sales than ever before, thereby keeping the administration of Bureau forests at the "grass-root" level. This results in quicker and more satisfactory service to that segment of the public which is interested in the management of Bureau forests.

The delegations of authority allow the State and area office more staff time for directing the work of the district offices and frees these staff members from the routine chores that can be done equally well at the district level.

Forestry Advisory Boards

In shaping up new policy or in strengthening old policy, advice is always sought from as many sources with diverging interests as is commensurate with the problem. A group of public-spirited citizens from various walks of life, joined together to give advice on policy questions, serve as a sounding board of public opinion and when used correctly such a group can render an invaluable service.

When the operating procedures and policies under the O. & C. Sustained Yield Act of 1937 were first being established, advice was sought from members of the lumber industry, from grazing and agriculture, from labor, and from the public at large. Men who represented these various interests and who were leaders in their respective fields were selected and appointed by the Secretary as members of an O. & C. advisory board. This group of men were consulted and their ideas were weighed before any major operating procedures or policies were put into effect. Although the board has no constituted authority to direct the Bureau in any way, its influence in Bureau affairs is strong.

The principle of advisory boards was so successful with the administering of the O. & C. timber lands as a whole that local boards have been set up—one for each of the O. & C. forest districts—to give advice regarding the carrying out of the various programs in the districts.

Trespass

Considerable effort has been devoted to the prosecution of trespass claims. Collecting on these claims not only adds to the revenues of the Bureau, but also, and more important, serves as a deterrent for the future. Similar results are achieved by the prosecution of fire damage claims. Significant in this respect was the filing of a suit seeking $1 million in damages from a lumber company in western Oregon.

Access Roads

Access to the timber is vital to the forestry program of the Bureau in western Oregon. Access roads must be built through rough and mountainous country where costly duplicating road systems would be an economic waste. Much time is spent each year negotiating reciprocal access road agreements with owners of existing roads and with owners of intermingled lands over which roads must be built. Such agreements provide for joint use of roads in the removal of both the private and Government timber.

Wherever possible roads are being built by logging operators. However, Government construction with appropriated funds is desirable where speedy development of extensive road systems is needed to minimize losses from deterioration in timber following fires, storms and insect epidemics and for situations where the size and cost of a necessary road project are beyond the financial ability of the logging operators of average means. In the past few years funds have been appropriated for approximately 100 miles of such Federal access roads. When all of these projects are completed, the opportunity for small operators to compete for Government timber will be greatly increased. These roads, by expediting the removal of huge volumes of dead and damaged virgin timber, will prevent losses running into the millions of dollars.

MINERALS

The flexibility of the laws under which the mineral resources are made available for use has within the last 3 years been dramatically demonstrated in the Williston Basin in North Dakota and Montana. Since oil was discovered in North Dakota in April 1951, more than 5,000,000 acres of public lands in these two States have passed into the hands of the petroleum industry for exploration and development. A system of leasing which permits the transfer of mineral lands to private citizens so rapidly in response to an unexpected flood of demand is of great value both to those States in which such activity takes place and to the national economy itself.

New legislation was introduced, upon which the Bureau prepared reports, to encourage the expansion of mineral activities and to permit the multiple use of Government lands for leasing as well as for mining activities. In the administration of these laws, the Bureau of Land Management performs a basic and necessary activity which contributes greatly to the proper conservation and development of the Nation's mineral resources so that they will serve not only the needs of the present generation but also of generations to come.

As a contribution to management improvement, a monograph on Federal mining law was prepared. This is a collection of the principal court and departmental decisions covering all points within the jurisdiction of the Bureau and so arranged as to afford ready reference with respect to the legal problem involved.

Activities Under the United States Mining Laws

Prior to May 1, 1954, the final processing of applications for mining patents was carried on in the Washington office. On that date, except for cases partially adjudicated, all applications for mining patents were decentralized to the land offices having jurisdiction over the lands applied for. There remained in process in the Washington office about 32 cases to be completed.

During the year, the regulations were amended to provide for the use of a certificate of title as well as an abstract of title in the patenting of mining claims; the mineral patent procedure bulletin was revised and manual procedures prepared relating to applications for patents covering lodes, placers, and millsites. An information monograph on mining locations, entries, and patents was prepared and issued.

The greatly expanded search for uranium resulted in the location during the year of a large number of mining claims, particularly in the Colorado Plateau area. This intensified activity has resulted in many thousands of additional inquiries at the land offices for information as to the availability of public lands for location as mining claims. In Utah a project has been carried on in cooperation with the Atomic Energy Commission and with the assistance of the petroleum industry for the microfilming of mining claim records in the county recorder's offices so that they would be more readily available in a central place for tracing titles to possessory rights acquired under the mining laws. Examinations and contest proceedings were continued during the year on the project for determining the validity of mining claims situated within the area which now constitutes the Marine Corps Base near Twenty-nine Palms, Calif.

Adjudication of Mineral Cases

The largest single group of cases handled by the Bureau during the year was the processing of noncompetitive oil and gas offers to lease, and applications for leases. During fiscal year 1954, the new and reactivated noncompetitive oil and gas lease offers and applications for lease amounted to 41,902 cases of which a total of 39,559 were closed during that period. There were approximately 17,255 oil and gas lease assignments closed during this period.

Table 1 discloses the number of mineral cases adjudicated in the continental United States during fiscal year 1954.

TABLE 1.—*Adjudication of mineral cases, fiscal year 1954*

Type of Case	Unclosed cases, July 1, 1953[1]	New and reactivated cases, fiscal year 1954	Cases closed June 30, 1954	Active	Suspended	Unclosed cases June 30, 1954
Mineral-patent applications	447	371	163	171	484	655
Oil and gas leases (n. c.)	8,720	39,869	37,476	7,133	3,980	11,113
Oil and gas assignments (record title only)	1,391	17,400	17,255	1,275	261	1,536
Oil and gas leases (comp.)	7	7	13	1		1
Oil and gas leases (acq.)	3,847	2,033	2,083	3,009	788	3,797
Mineral leases (acq., n. e. s.)	93	98	184	7		7
Mineral leases (n. e. s.)	147	58	101	4	100	104
Mineral permits (acq.)	99	117	208	8		8
Mineral permits (n. e. s.)	1,228	1,260	731	575	1,182	1,757
Resource sales (mineral)	25	53	44	6	28	34
Total	16,004	61,266	58,258	12,189	6,823	19,012

[1] Adjusted.

The oil strike made near Elko, Nev., in February 1954, greatly accelerated the oil and gas leasing activities in that State. Following the announcement of the discovery of oil in Nevada, it is significant to note that approximately 500,000 acres of Federal land in Nevada were leased for oil and gas purposes in the 4 days following this announcement. This greatly increased the activities of the local offices and the amounts received in filing fees and advanced rentals reached very high amounts. There was considerable increase in oil and gas activities throughout all the Western States. The increase in Wyoming was brought about by continued discovery of fields in that State.

Leasing activities in the Williston Basin continued apace. Throughout the Western States there was an increase in activities in mineral leasing not only for oil and gas but of phosphate, potash, and similar minerals as well as in mining activities.

Leasing Activities on the Outer Continental Shelf

The act of August 7, 1953, known as the Outer Continental Shelf Land Act, vested authority in the Secretary of the Interior to issue permits and leases for the exploration and production of oil and gas and other minerals from the outer Continental Shelf.

Under section 6 of the act, mineral leases issued by the States of California, Louisiana, and Texas for submerged lands within the outer Continental Shelf as defined in the act, could be continued under the conditions outlined in the notice to holders of State leases published by the Department on September 14, 1953. As of November 5, 1953, the closing date set in the notice to holders, 404 State leases were filed for the necessary determination, of which 300 were for Louisiana lands and 104 for Texas lands.

A notice of proposed regulations concerning oil and gas and sulfur leases and operations in the outer Continental Shelf was published in the Federal Register on February 11, 1954. These proposals followed closely the proposals made by a group of operators now prospecting and producing oil and gas in the outer Continental Shelf under State leases. Industry was granted 30 days from the date of publication to submit such suggestions or objections which they deemed appropriate. Various suggestions were received, and on the basis of them, the regulations governing the recognition of the State leases and the disposition of the minerals in the outer Continental Shelf areas were approved, effective May 10, 1954. The adjudication of the section 6 leases is in progress. Pursuant to the authority prescribed in section 201.20 of the approved regulations, notices were duly published in the Federal Register calling for nominations of the areas to be offered for oil and gas and sulfur leasing off the States of Louisiana and Texas, such nominations to be submitted not later than August 3, 1954, for areas off Louisiana, and September 3, 1954, for areas off Texas.

The nominations received will be considered by the Department in the selection of areas to be offered for competitive bidding, and any published notice of lease offer will state the conditions and terms for lease, the place, date, and hour at which the bids will be opened. Such dates have been tentatively set for October 13, 1954, for areas off Louisiana, and November 9, 1954, for areas off Texas. The Department has established an information office at New Orleans, La., to handle outer Continental Shelf matters.

Reorganization and Decentralization of Washington Mineral Activities

Following the recommendation of the survey team, the processing of all applications, including potash, phosphate, and other nonmetalliferous minerals, was delegated to the Bureau's State land offices wherever feasible. A decentralization program was immediately undertaken to carry out this recommendation, and by the end of the fiscal year the processing of all applications for mineral patents and the adjudication of mineral claims was decentralized.

The decentralization to the land offices of the remaining types of cases was scheduled as follows:

Date	*Type*
August 1, 1954	All leasable minerals other than oil and gas
November 1, 1954	Producing oil and gas leases and related matters
February 1, 1955	All acquired lands cases, oil and gas, and other minerals

Besides assuming responsibility for the additional cases delegated from Washington, the land offices continued to carry on the adjudication of minerals cases previously processed, maintenance of mineral records, handling of mineral contest proceedings, collection of lands and minerals fees and rentals, and servicing inquiries from the public for information regarding the lease and disposal of mineral resources.

The responsibility for mineral examinations was placed upon the State supervisor and his staff. The minerals activity in the Washington office has been placed under the minerals officer, who with his staff will serve in an advisory capacity to the Director in the review of proposed or new legislation; the preparation of amended or new regulations, procedures, and manual instructions; in the review of problems involving mineral policy; and in the preparation of mineral programs for the Bureau.

Revenues

The chief source of revenue to the United States from the use and disposal of resources on the public lands is from leases issued under the mineral leasing acts. The revenue in fiscal year 1954 from royalties and rentals under the mineral leasing acts was $59,861,932, compared with $49,176,703 in fiscal year 1953. The major source of receipts was from royalties, rentals, and bonuses for oil and gas leases.

A summary of bonuses received from competitive mineral leasing, by States, on lands within known geological structures, follows in table 2.

TABLE 2.—*Competitive leases, fiscal year 1954*

Mineral and State	Total		Acquired lands		Public domain	
	Acres	Bonus	Acres	Bonus	Acres	Bonus
Oil and gas:						
California	512.50	$15,904.10			512.50	$15,904.10
Kansas	240.00	14,245.60	160.00	$12,025.60	80.00	2,220.00
Louisiana	120.00	1,355.00			120.00	1,355.00
Michigan	40.00	160.00			40.00	160.00
Montana	440.00	21,370.00			440.00	21,370.00
New Mexico	4,071.30	147,478.29			4,071.30	147,478.29
Ohio	179.38	197.32			179.38	197.32
Texas	954.51	25,218.72	954.51	25,218.72		
Wyoming	1,168.10	29,983.03			1,168.10	29,983.03
Total oil and gas	7,725.79	255,912.06	1,114.51	37,244.32	6,611.28	218,667.74
OTHER MINERALS						
Phosphate:						
Idaho	2,640.15	28,582.07			2,640.15	28,582.07
Montana	812.27	3,109.74			812.27	3,109.74
Coal: Oklahoma	400.00	420.00			400.00	420.00
Potash: New Mexico	440.00	27,060.00			440.00	27,060.00
Manganese: Tennessee	70.00	87.50	70.00	87.50		
Total other minerals	4,362.42	59,259.31	70.00	87.50	4,292.42	59,171.81

INTERNATIONAL COOPERATION

A greater awareness of the Bureau of Land Management's experience in land and resource use, development, and management is resulting in increasing demands upon the Bureau for technical advice and assistance to other countries. The Bureau contributes its skills to the international scene in a variety of ways:

Problems and Programs.—During the past fiscal years, 16 Bureau technicians were working on overseas assignments exploring specific problems. These men were providing technical assistance under the technical direction of the Bureau on range management, forestry, cadastral engineering, and broad programs of land use planning. They were also consulting with other governments on basic land problems regarding ownership, leasing, and settlement, which are becoming very pronounced in individual security and country stability. In addition to the technical backstopping of its overseas employees, Bureau facilities and technical employees are constantly being utilized by the specialized United States agencies in foreign activities for advice and assistance on technical land and resource problems and programs pertaining to essentially all countries. There is a large demand for Bureau publications and other information by the nations of many countries.

Training and Observation.—Thirty-one foreign leaders and technicians were with the Bureau under the technical exchange program for periods ranging from 4 months to a year observing various phases of the Bureau's domestic program of land and resource management. One outstanding project was the leadership for the observations of

23 North Africa and Middle East leaders who studied arid land and resource problems in our west. Followup activities in their countries are showing that they gained much information which is leading to a fuller development of their land and natural resources with substantial benefits to the free world. During the year, the following 12 countries were represented by leaders and trainees: Thailand, Libya, Philippines, Formosa, Egypt, Iran, Iraq, Jordan, Lebanon, Pakistan, Saudi Arabia, and Turkey. In addition to this, the Bureau provided leadership and training programs overseas to develop young technicians who could handle land and resource problems peculiar to their country. Thus, the Bureau participates in technical training programs both here and abroad to effectively disseminate the skills and philosophy necessary for successful resource development. In addition to the formal technical exchange programs, Bureau facilities are constantly utilized by visiting technicians from all over the world.

Conferences.—The Bureau cooperates with committees, agencies, boards, commissions, and other bodies concerned with national and international land management problems. The Bureau technicians are frequently called on to contribute to international meetings and conferences. During fiscal year 1954, nine Bureau officials attended such conferences outside of this country.

The orderly development of our lands and natural resources contributed much to this Nation's greatness. Through its overseas program the Bureau cooperates with specialized international agencies in increasing the strength and prosperity of friendly nations by guiding other countries to a more fruitful use of their land and resources.

SUMMARY

A summary of the Bureau of Land Management's major activities for the fiscal year 1954 shows:

Cadastral Engineering

Approximately 1,320,000 acres of land were surveyed or resurveyed for such essential purposes as the development of uranium deposits and other mineralized areas, determination of the boundaries of valuable timber lands, school sections to facilitate State selections, small tracts for homesites and recreational purposes, execution of reclamation projects, town lots, and trade and manufacturing sites.

Of major importance were the completion of the leasing maps for approximately 12 million acres on the outer Continental Shelf offshore from Louisiana and the start made on similar maps for 8 million acres offshore from Texas. This work provides the basic data for describing and locating areas potentially very valuable for the production of oil and other minerals.

Interest in the leasing of land for mineral production in Alaska is increasing. Because the cadastral surveys in Alaska cover less than 1 percent of the Territory and are inadequate to meet the needs, protraction maps were prepared to provide a basis for leasing in order to assist oil and gas prospecting operations within a large area.

Lands

The revocation of a large number of withdrawals which reserved public lands for uses no longer required resulted in freeing additional resources for development. Public lands actually needed for public purposes continue to be reserved. Obsolete withdrawals consisting of 1,777,000 acres were revoked during fiscal year 1954. New procedures were adopted and are operating effectively in providing a better understanding of the purposes of proposed withdrawals.

Applications to acquire public lands were received in a larger volume during the year than in the preceding year. Applications to acquire small tracts for home and recreation sites contributed most to the increased number of applications. The work accomplished in handling applications completed during fiscal year 1954 was considerably greater than in 1953, but due to the large receipt of applications it was impossible to reduce the backlog of pending cases. Aggressive steps through the reorganization and improved procedures are being taken to more effectively handle land cases.

Large areas of the public lands were classified to facilitate land disposal and land management actions. The acceleration of land classifications for relatively homogeneous areas contributed substantially to the handling of applications, several of which had been pending decisions for several years. Many tracts of public land were classified as suitable for disposal on which applications have not been filed. A program for disposing of these lands is underway. Several land ownership pattern adjustments are in process to provide a foundation for land management improvement by Federal and State agencies. Through the area land classification activity, much useful data was also obtained for water, soil, and other conservation practices in river basins.

Range Management

The adjustment of grazing to the proper grazing capacity of the lands, through the reappraisal of range privilege adjudications and stocking, received primary emphasis in the range administration program during the year. Reservation of forage for big game animals is being made to provide a proper balance between livestock and wildlife use of the Federal range. Range use supervision was better and more intensive than at any time since the Federal range was brought under regulation.

Sheeptight fences which have been developed recently in Montana and Wyoming on public ranges that are utilized by antelope have caused difficulties in the multiple use of the lands for both livestock and wildlife. A joint study of sheeptight fences was completed by the Bureau of Land Management and the Fish and Wildlife Service. The study provided the information needed for the development of suitable fencing on public lands to meet the requirements of the livestock industry and at the same time protect the public interest represented in the antelope and other wildlife resources.

Permits, licenses and leases were issued to approximately 29,000 stockmen during the year for the use of the public domain. These authorized grazing of over 9 million head of livestock. Through soil and moisture operations to improve the public lands and protect the resources, conservation practices were effected on 650,000 acres.

The soil and moisture conservation program is proving more successful through modifications which were accomplished for the conduct of this activity on a watershed basis extending the area covered to all the public domain within a watershed and providing complete watershed protection. Much progress was made in the projection of long-range conservation plans.

The soil and moisture work of the Bureau of Land Management is more and more attracting favorable attention. This reached a high point during the year when the Bureau at the request of the Foreign Operations Administration and in cooperation with other agencies, ranchers and many additional local people conducted an intensive 90-day training tour of range conservation projects including waterspreading, for 23 leaders from 9 Middle East countries. This was a continuing activity throughout the year and was followed up by a successful on-the-ground training center in Jordan sponsored by the Jordan Government and the Foreign Operations Administration in which Bureau officials participated. Jordan has placed a long extensive arid and semiarid range conservation program into operation. Several other countries are initiating similar programs for which they need technical assistance. Through this work a large amount of technical material was developed which is proving of benefit to technicians of the United States as well as those of other countries.

One of the most important programs of the Bureau is the control of halogeton, a weed poisonous to livestock which has invaded the western range lands. Over 4 million acres of the public domain is invaded by halogeton. Reseeding the ranges to useful grasses with which halogeton cannot compete and chemical control under certain conditions are proving to be the most effective methods to eliminate or reduce the concentration below the critical point. As a direct halogeton control measure, 125,000 acres of range land were reseeded and 25,000 acres were prepared for seeding. The program has been in operation nearly 3 years with a total of 325,000 acres reseeded. A coordinated research program in which the Bureau is participating and supporting with the Department of Agriculture and land grant colleges is yielding important information essential to effective control of the plant.

Forestry

The largest annual sale of timber from lands under the jurisdiction of the Bureau of Land Management was accomplished in fiscal year 1954 with the sale of 696 million board feet for over $12 million. The total value was about $1 million less than 1953 because of lower prices.

There have been a large number of Douglas fir trees killed on the O. & C. grant lands in Oregon in recent years. An epidemic of Douglas fir bark beetle has occurred because the dead trees provide an ideal breeding place for this pest. The Bureau is aggressively assisting in attacking this problem by removing and salvaging infested trees. This program is 60 percent complete. It was advanced substantially during the year by salvaging over 340 million board feet of infested timber.

Many long time programs for improving forest management were advanced. These included a current forest inventory utilizing aerial photographs and other modern techniques. A new appraisal of the Coos Bay Wagon Road grant lands in Oregon from which Coos and Douglas Counties receive tax equivalent payments was completed.

Minerals

For the first time the final processing of applications for mining patents is being accomplished in the field with the establishment of State offices and the decentralization of the work through the recent reorganization of the Bureau of Land Management. This is resulting in improved service to the mining industry.

Over 58 thousand mineral cases were adjudicated and closed in fiscal year 1954. Approximately 40,000 of these were noncompetitive oil and gas lease offers and applications.

Mineral activities were very heavy during the year, primarily due to recent discoveries of oil and gas and intensified explorations for uranium and other fissionable materials. Thousands of inquiries as to the availability of public lands for locating mining claims for fissionable materials were received. A project was carried out in cooperation with the Atomic Energy Commission and the petroleum industry for the microfilming of mining claim records in the county recorders' offices in Utah so that they would be more readily available for determining possessory rights acquired under the mining laws. New discoveries of oil in Nevada, Wyoming, Montana, and North Dakota and the issuance of permits and leases for the exploration and production of oil, gas, and other minerals on the outer Continental Shelf contributed substantially to the large workload in processing applications. New legislation and the demands of the public required the preparation of several regulations and other material to assist exploration and development of minerals in the public lands and lands in which mineral rights were acquired or retained by the Government.

Fish and Wildlife Service

John L. Farley, *Director*

☆ ☆ ☆

THE Fish and Wildlife Service exercises Federal responsibilities for the conservation of birds and mammals and fishes. Fish and wildlife constituted the first basic primitive wealth of our country. Through its predecessor agencies, the Service had its origin about three-quarters of a century ago in a growing national concern for the future of these resources that had once seemed inexhaustible. By efforts to ensure prudent use, by direct management of certain resources, and above all by the basic research essential to wise management, the Service has helped conserve these resources of fish and wildlife so that they still have tremendous economic values and inestimable recreational values.

Tomorrow's problem will be not merely the utilization of resources to produce maximum quantities of food, fiber, and other material things. More realistically, it will be the problem of maintaining the kind of living standard for the individual that we have come to regard as an American right. Our living standard includes more than necessities and is distinguished by things few other peoples in the world enjoy in the same measure as we: Recreation in the out of doors, including the free harvesting of public resources like game and fish, the use of parks and other recreational areas, and the enjoyment of common public property in other ways. These can be preserved only by a realistic and carefully calculated conservation program. Such a program must be based upon continuous, painstaking research.

RESEARCH IN WILDLIFE MANAGEMENT

The Cooperative Wildlife Research Unit program, carried on jointly by the Fish and Wildlife Service, the Wildlife Management Institute, and the land-grant colleges and conservation departments of 16 States and the Territory of Alaska, is now in its 19th year. It has been effective in facilitating the training of wildlife personnel, in promoting basic research, and in providing technical information to conservation agencies and the public.

A total of 221 wildlife students graduated from the unit schools during the school year 1952–53. About a fourth of these went into military service, and a fifth went back to school for advanced degrees. Most of the others obtained positions with State and Federal conservation agencies or educational institutions.

Research findings based on cooperative-unit studies were published and distributed as 129 technical papers, bulletins, and popular articles in 1953. Research projects numbered 248 and involved work on small and big game, waterfowl, fur animals, wildlife environment, and many other phases of wildlife management.

One section of eight research biologists conducted wildlife investigations on public lands, working closely during the year with public-lands agencies, chiefly the Forest Service. Specific projects, mostly long-term and numbering at least 20, included studies of deer browsing on plantations and forest areas, appraisal of damage by small rodents, production of food for wildlife, and ecological and life-history assignments dealing with deer, quail, woodcock, and other species.

Another section investigated wild fur animals. Population studies of the fur seals on the Pribilof Islands were made in cooperation with the University of Washington and produced facts of use in managing the fur-seal herd.

A preliminary sea-otter study, in cooperation with Purdue University, was made on Amchitka Island, Alaska, to determine the possibilities of restocking this marine mammal in areas of its former range. Studies on the ecology of the muskrat and the nutria in gulf-coast marshes were made in cooperation with the Louisiana Wild Life and Fisheries Commission.

Research on bird and mammal distribution was continued with increased emphasis, among the migratory game birds, on the mourning dove, Wilson snipe, and woodcock. Better census techniques for these migratory game birds are being developed to increase the knowledge of their distribution, numbers, and migration routes that is needed for management.

The bird-banding program, participated in by Service, State, Provincial, and private biologists, has been improved by better coordination with the Canadian Wildlife Service, modification of the reporting system, standardization of color-marking of birds, and issuance of a revised manual for bird banders.

A book on the biology, habits, and economic importance of the American bobcats is nearing completion. This will conclude a series of such books by Service biologists on the larger mammalian predators including the wolves, coyotes, mountain lions, and bobcats.

Search continues for foreign game species that might thrive in large areas no longer likely to be productive of native species. Two game birds from the Middle East and one from Spain are currently being tried out in cooperation with five Southwestern States.

The Patuxent and the Denver Wildlife Research Laboratories are the largest field stations maintained by the Service for wildlife research. Biologists and chemists at these centers study factors that threaten wildlife resources and develop methods for reducing wildlife damage to other resources. Primary factors adversely affecting wildlife resources include diseases and parasites, excessive use of herbicides and insecticides in the control of agricultural pests, and deterioration or loss of wildlife habitats through excessive grazing, certain farming practices, and drainage.

Current disease studies include determination of the cause of the Canada-goose losses that periodically become serious along the Atlantic coast, investigation of an unknown lethal virus infection found in raccoons at peak population levels, and research on the biology of the causative organism of trichomoniasis, a disease that causes severe mortality in mourning doves. Research in avian botulism, a cooperative project with the Rocky Mountain Laboratory of the Public Health Service, has pointed to minute invertebrates as a probable medium in which the bacteria, which cause avian botulism, multiply to outbreak proportions. A study of these invertebrates, and the soil in which they live, is under way.

Thorough knowledge of the causes of wildlife diseases and the means by which they are spread and sustained in populations will make possible improvements in management of wildlife and their habitat.

Control of weed and insect pests is a major problem. Chemical means developed in recent years often give efficient and economical control of pests; but some of these chemicals are known to be dangerous to human life; and many others have been shown, under some conditions, to cause high mortality among wildlife species. Within the limits of its resources, the Service evaluates effects of new chemical control agents on wildlife populations, and attempts, in cooperation with other interested agencies, to establish standards for formulations and rates of application that will meet the requirements for control without needlessly destroying wildlife.

Toward this same end, field tests are being conducted in cooperation with the Department of Agriculture and several State agencies to determine the possibilities for controlling the breeding of mosquitoes in impoundments by manipulating water levels rather than by drainage which is in conflict with development of marshes for waterfowl.

Other assignments deal with means of reducing wildlife damage to crops, stored foods, and other resources. Attempts are being made in cooperation with several State agencies to develop more effective devices and procedures to reduce bird damage to sweet and field corn, rice, and other crops. Aerial bombs mounted in panels and ignited by slow-burning rope fuses have been found, in early studies, to afford an economical form of protection; other methods, including the use of repellents, are being tested.

Damage by wild and commensal rodents is intensive and varied. Stored food materials are especially vulnerable to attack by rats and house mice. In some areas, reforestation is severely hampered by seed-eating rodents. Research at the Patuxent and Denver Laboratories includes developing and testing new chemicals for use as control agents or repellents. Service chemists have tested some 7,000 compounds during the past 5 years. This work has led to the development of several promising control agents and repellents, for protection from rodent damage. The Defense Department and various chemical companies have assisted in this program.

Foresters, whose attempts at reforestation by direct seeding have been seriously hampered by rodents, have cause for optimism in the unique performance of tetramine. This highly toxic compound, extensively field-tested as a seed treatment, kills some mice, "educates" others to leave seeds of the treated species alone, and translocates into seedlings. Unfortunately, the chemical has no known antidote and is far too hazardous for general use.

Through experimentation and extensive field testing a compound has been formulated which, when applied to dormant deciduous trees and shrubs, showed promise in preventing rabbit damage. No appreciable phytotoxicity was found in the treatment of 64 species of trees and shrubs, and the repellent film was highly resistant to weathering.

It has been estimated that more than 75 percent of American fur and game is produced and harvested on farmland. Consequently, what happens to the farm habitat may be the most important single factor influencing wildlife resources for tomorrow. The Fish and Wildlife Service, in cooperation with the Soil Conservation Service, has undertaken the task of evaluating various land-use practices that increase or improve the quality of wildlife food and cover on the farm without seriously interfering with efficient farming practices. Two experimental farms are operated at the Patuxent Research Refuge to test promising materials and procedures for creating living space for wildlife on the modern farm.

Quality and availability of foods are important factors in the distribution and survival of game birds in nature. One assignment, completed during the year, helps explain the distribution of the ringneck pheasant on the basis of availability of calcium in surface soil or grit. This popular game bird cannot meet its calcium requirements from normal food sources, and where a calcium supplement is not available in the form of grit, the species cannot maintain an adequate reproductive level for survival. Other investigations under way include studies of the relations of certain vitamins, minerals, and protein levels to survival of pheasant and quail populations. Such studies offer promise of explaining success or failure of these birds in many parts of their potential ranges.

The most effective solutions to the problem of ever-shrinking waterfowl habitat are the creation of new impoundments and the improvement of natural marshes and water areas. Progress has been made in developing management methods for improving the dark, acid water impoundments characteristic of the Atlantic coastal region and for replacing marsh weeds with more useful species. This expands the carrying capacity of marshes for waterfowl. Manipulation of water levels in experimental impoundments has resulted in reduced turbidity and in increased growth of desirable food plants. Improvements have been made in the design of impoundment structures to provide more precise control of water levels to meet requirements of waterfowl management.

Since 1935 the Service has published Wildlife Review as an abstracting service for the wildlife field. In the past year, three issues were released covering 1,500 technical papers, bulletins, and books. This publication, with a circulation of approximately 3,100, is distributed nationally, and brings to conservation agencies and educational institutions up-to-date information on wildlife biology and management.

RESEARCH IN FISHERY BIOLOGY

Coastal Fisheries

In southeastern Alaska, with the building of a pulp mill in Ketchikan, logging in the area will double or even triple in the next few years. This will increase the problem of protecting pink-salmon spawning areas. Experiments over the past 4 years near Little Port Walter indicate that spawning areas between high- and low-tide levels in the mouths of many Alaska streams are as productive of pink salmon as fresh-water areas above the intertidal zones. Future measures to protect these streams from the effects of logging and other activities will include provisions to protect the intertidal spawning areas.

Circumstances that caused failure of the 1953 pink-salmon runs in southeastern Alaska occurred after the fry had left fresh water. The 1951 escapement appeared adequate (pink salmon invariably return at 2 years of age), and egg and fry survival conditions were excellent. The fresh-water survival index, which was established several years ago and is valuable in measuring early mortality, was above average for the 1951 brood. Pink-salmon runs are noted for their extreme and erratic variability in returns. Past studies have shown that conditions affecting fresh-water survival have caused much of this variability. As part of ocean-survival studies, young fry have been marked by fin clipping and released as they were leaving fresh water. From mark returns, it was estimated that the ocean-survival rate of 1953 was only about one-tenth that of 1952. For the 1953 run the fresh-water survival as measured at Little Port Walter had been the highest in 12 years of records; catastrophic events in the sea allowed an ocean survival of only 0.3 percent, which wiped out any previous gain and produced the poor catch.

Passage of an unusually large run of blueback salmon over Zosel Dam on the way to spawning grounds on the upper Okanogan River in Canada shows that seriously depleted runs can regain former importance. Service surveys located virtually no fish as recently as 1941, but this year the Washington Department of Fisheries counters have recorded over 67,000 bluebacks passing through Zosel Dam fishways.

The large blueback run to the Okanogan this year results from combined contributions from 1949 and 1950 year classes. The return of such a large percentage of bluebacks in their third year is unusual, although it did occur to some extent in 1939 and 1940.

The Canadian Department of Fisheries, the Washington Department of Fisheries, and the Service have been jointly studying the Okanogan for the past 3 years. The Service has collected scales and has recorded lengths of some 525 bluebacks tagged at Zosel Dam. Scale examination shows that 98 percent of these fish, most of them females, were 3-year-olds from the 1950 brood.

A controlled-flow experimental stream has advanced natural-propagation studies of king salmon at Mill Creek in California. This project is being carried out by the Service and the California Department of Fish and Game. The stream has been created in the old north fork of Mill Creek at Los Molinos, which has been dry until recent years brought high water conditions. The channel has been deepened, and the water flow controlled by a gate at the head of a 30-inch culvert through an earth-fill dam at the channel head.

A study is being made of the early life history of king salmon. In experiments last year on egg survival in Mill Creek, there were severe egg losses because of extreme flood conditions. In present studies, plastic screen bags containing fertilized eggs were planted in November and will be periodically removed for comparison of survival conditions in Mill Creek with those in the controlled-flow channel.

Observations were continued on crab fishing and crab populations in the Bering Sea.

As part of a coastwise investigation of the Atlantic shad, to provide fishery-management information for the Atlantic States Marine Fisheries Commission, the Service tagged 238 shad in the Ogeechee River in Georgia.

By use of catch and fishing-effort records in conjunction with analyses made by biologists tagging and studying shad in the Connecticut River, it was possible to predict with only 5-percent error the 1953 run of 230,000 shad. With fishing effort at the level recommended by the Service, the 1953 run exceeded that of 1951 by 50,000 fish and that of 1950 by 100,000 fish.

The fishway at Holyoke (on the Connecticut River), a radically new flume and lock type developed by the Holyoke Water Power Co. in collaboration with the Service, passed 262 shad in 1953, and successful spawning occurred above the dam. Larger numbers of fish are required to build an upstream run, however, and improvements to the fishway are contemplated for the 1954 operating season.

Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Maryland, Virginia, South Carolina, and Florida are participating in the Atlantic States Cooperative Striped Bass Program, which began in early 1954. The Service coordinates this program. Striped bass tagged in Maryland and New Jersey waters totaled 358.

Inland Fisheries

Major emphasis in the Great Lakes program was on controlling the sea lamprey. Activities consisted largely in further testing and refining of electrical barriers, completing researches on lamprey biology, testing larvicides, and continuing a survey of streams tributary to Lake Superior. Fifty-eight electrical and mechanical sea-lamprey-control devices are operating on Lakes Superior, Michigan, and Huron. On Lake Superior, all United States streams having a known lamprey run are under control.

The completed limnological and fishery survey of Lake Superior has increased knowledge of the life history, distribution, and abundance of lake trout and other species. A similar survey of central and southern Lake Michigan was begun.

In an effort to learn why there are enormous overwinter losses of trout in most streams in the United States, four experimental stream sections at the Convict Creek, Calif., experimental station have been stocked with native and hatchery trout. In these sections, which total a mile in length, water flow and fish movements can be controlled. Stocking experiments to compare overwinter survival of stream-resident brown trout and hatchery-reared, catchable-size rainbow trout showed known losses to be slight for both species.

Research to improve fish-hatchery production and efficiency continued. New drugs and chemicals were tested to develop better prophylactic treatment for hatchery fish and to determine the efficacy of certain chemical compounds for attracting or poisoning fish. In fingerling brook trout, terramycin stopped mortalities caused by ulcer disease and furunculosis, while aureomycin had no effect. Treatment of brook trout with chloramphenicol produced more lasting results than treatment with terramycin only. Adding antibiotics to food of normal brook trout has a growth-promoting effect only if the fish are fed at an excessive rate. Identification of several new bacterial fish diseases is being attempted, and control methods are being investigated. Experiments were made to determine effect of fertilization on bacterial population of warm-water fishponds.

The 1953 blueback salmon feeding trials were a loss because of a virus outbreak in the experimental fish; the 1954 trials are in progress. A vertical incubator with a capacity of 1,000,000 chinook eggs or 2,000,000 blueback eggs was constructed and gave satisfactory results.

Tag recoveries in Yellowstone Lake and its tributaries indicate that after initial spawning there is little likelihood of postspawners surviving to enter the fishery or spawning a second time.

As a result of studies of the fishery resources of Shenandoah National Park, the Service has recommended to the National Park Service closing of all park streams to fishing during the 1954 season because of disastrous drought and flood effects on the trout population.

Marine Fisheries

One of the most important aspects of the research at the Woods Hole, Mass., laboratory is the study of the biological effects on the haddock of the regulation of the International Commission for the Northwest Atlantic Fisheries which makes it illegal to fish for haddock on Georges Bank or in the Gulf of Maine with a net having meshes of less than 4½ inches inside dimension. The Commission approved the regulation, which has been in effect 1 year, on an experimental basis and requires a careful assessment of its effect. Use of the larger mesh saves small unmarketable fish and should increase the yield from each year class that enters the fishery.

Studies on redfish age and growth showed that age in the commercial catch varies from 6 to 20 years; age at first maturity is about 11 for males and 9 for females. Total redfish catch has leveled off in the Gulf of Maine, on the Nova Scotian Banks, and in the Gulf of St. Lawrence. Rich grounds on the Grand Banks declined 15 percent in abundance during the past year.

The continued survey of the Delaware Bay sport and commercial fisheries is designed to yield information on effects of industrial pollution. A biological study of menhaden was begun with expectations of developing a research program on this species.

The Service, the Department of the Navy, the Georgia Game and Fish Commission, and the Florida State Board of Conservation (through the Marine Laboratory of the University of Miami) are making a biological, chemical, and physical oceanographic survey of South Atlantic coast waters. Six cruises have been completed with the vessel *Theodore N. Gill* to study currents, to study distribution and abundance of fish eggs, larvae, and juveniles, to discover spawning areas of various fish, and to carry out a biochemical study having a bearing on the biological potential of the area. Swordfish, sailfish, dolphin, and mullet eggs or small larvae were taken in the Gulf Stream along the Florida coast.

Cruises of the vessel *Alaska* found fish larvae most abundant in northern gulf waters from Galveston to Chandeleur Island and in southeast gulf waters from Sanibel Island to Key West. Concentrations of larvae occurred close to shore or in shallow waters rather than in the central open gulf.

Mass mortalities of fish have occurred in Florida west-coast waters. The microscopic organism *Gymnodinium brevis*, which causes the kills when it occurs in extreme numbers, has been in coastal waters since last September. Research to determine causes of red tides further confirms earlier theories that river effluents carrying organic nutrients and the correct combination of temperature and wind conditions produce a suitable environment for rapid reproduction of the microorganisms. Laboratory cultures of *Gymnodinium brevis* were established through use of Florida-soil extracts, fish-flesh extracts, trace elements, sulphides, and vitamin B–12, along with strong light, to determine its chemical and physical requirements for use in developing possible control measures.

The Service cooperated with the National Park Service in taking a census of the California gray whale as it passed southward along the California coast to Baja California lagoons to calve and breed.

The Service continued study of the Pacific sardine in cooperation with the Scripps Institution of Oceanography. California Division of Fish and Game, California Academy of Sciences, and Hopkins Marine Station of Stanford University. The sardine catch was again low, and southern California has ceased to be an important spawning center. The smaller amount of spawning off central Baja California than in 1952 and previous years indicates a smaller spawning population in that area. Small numbers of sardines surviving from 1949, 1950, and 1951 spawnings constitute the spawning stock. The center of spawning off central Baja California was 40 miles north of the usual center of recent years.

The most abundant larvae taken on these cruises are hake, whose center of abundance is off southern California and adjacent Baja California, between Point Conception and San Quintin Bay. Other species under study are the anchovy and jack mackerel. Anchovy larvae occur in a continuous band between Point Conception and central Baja California.

Vessel scouting for tuna in the central Pacific showed that expansion of the Hawaiian tuna industry will depend largely on measures to increase the geographical area that the fleet can cover, through construction of larger, better-equipped vessels and improvement of the fishermen's navigational ability. Landings of large quantities of yellowfin tuna show that there is an unexploited and potentially highly valuable commercial fishing resource within ready reach of the Hawaiian Islands. Albacore, the highest priced of the tunas, undoubtedly would be a profitable secondary product of a yellowfin fishery in those waters. Data were collected which will help to determine seasonal changes in waters and to explain fluctuations in the skipjack catch. Yellowfins are being tagged in an effort to trace their seasonal migrations into and out of Hawaiian waters.

Data collected from waters from the surface down to 4,000 feet indicate rich oceanic waters about 800 miles north of Hawaii in a region of transition from the warm westerly flowing north equatorial waters, found typically around the Hawaiian Islands, to the colder easterly flowing north Pacific drift waters. In this boundary region between the two currents, plankton was relatively more abundant than to the north or south. Albacore were caught in this transition zone due north of Hawaii, but none were caught farther to the east.

Shellfisheries

Productivity studies to determine how many bushels of hard clams can be removed each year from Greenwich Bay, R. I., without causing depletion should assist each State having the problem of managing a public clam fishery. A fence was built that successfully protects clams both from green crabs and from horseshoe crabs. Several New Hampshire and Massachusetts towns are interested in building fences similar to this one. Studies are being made of the biology of green crabs, which are being tagged in an effort to trace their migratory routes.

Studies at Milford, Conn., on oysters from different geographical areas show that different physiological races of oysters exist. Bulletins informed the industry and biologists during the summer of 1954 of oyster spawning and setting progress. Oysters were successfully cultivated in salt-water ponds. European oysters, *Ostrea edulis*, live and propagate under New England conditions.

Progress has been made in research on problems of oyster cultivation peculiar to the Gulf of Mexico, including oyster growth rates and seasonal reproductive cycles of oyster predators, such as the drill, boring clam, and boring sponge. The northern Gulf area does not provide an especially good environment for hard clams.

Studies continue at Beaufort, N. C., on accumulation and retention of radioactive elements, particularly strontium, yttrium, and cesium, in bodies of marine invertebrates of economic importance.

The 1953 joint survey, with the State of Maryland, of the Maryland part of the Chesapeake Bay and tributaries found that market-size oysters are fewer this year than last. Small oysters are fewer than market size this year, which may mean a smaller harvest for 1954–55.

Spatfall in all places, except in some Eastern Shore tributaries, was sparse and will be responsible for a continued low oyster yield from Maryland.

NATIONAL WILDLIFE REFUGES AND THE DUCK STAMP

Two decades (1934–54) of intensive wildlife-refuge acquisition and development have been completed. During this period, the area of the national waterfowl refuges has increased from 851,689 acres to 3,269,549 acres. Without this expanded program and the opportune legislation that made it possible, it is doubtful whether waterfowl populations could support the present level of public hunting. In view of the generally favorable conditions, a review of the enabling legislation and accomplishments thereunder is in order.

In the early part of this century, migratory waterfowl had been seriously reduced through lack of adequate protection, and several important species were on the verge of extinction.

In the early 1920's, following proclamation of the Migratory Bird Treaty of 1916 and the treaty-enabling act of 1918, legislation proposing the establishment of a system of national waterfowl refuges was introduced in the Congress. This legislation, in modified form, was finally adopted as the Migratory Bird Conservation Act of February 18, 1929, and authorized the establishment of inviolate migratory-waterfowl sanctuaries. It authorized appropriation of $875,000 in the first 3 years and $1,000,000 a year in the next 7 years, for the acquisition and development of the refuge system contemplated by its provisions. Appreciable funds authorized by this legislation were not forthcoming, but emergency funds totaling $14,500,000 were allotted, largely for the continuation of this work in connection with unemployment relief, submarginal-land retirement, and drought-relief programs, which enabled refuge acquisition and development to continue with redoubled vigor.

The third act in furtherance of the treaty for the protection of birds migrating between the United States and Canada was the 1934 Migratory Bird Hunting Stamp Act. This legislation requires each person over 16 years of age who hunts migratory waterfowl to obtain a Federal duck stamp each season (stamps now cost $2 each).

From 1935, the first year of revenue under the new act, to June 30, 1953, about $35,000,000 was received. Almost $30,000,000 of this was spent on the waterfowl program.

This however, is only part of the picture. Duck stamp funds have been used in the development and operation of some 3,000,000 acres which were made available to the Service from other sources. This large total includes areas made available for waterfowl-refuge purposes as a secondary use on irrigation reservoirs, flood-control projects, and drainage districts, as well as lands acquired specifically for waterfowl with other funds made available in the early days of the restoration program. Thus the duck stamp funds have become the lifeblood of the Service's waterfowl-refuge program, even though only about one-sixth has been used for actual land purchase.

One of the finest areas in the entire refuge system was secured recently with only a small amount of duck stamp money needed to provide a few critical tracts. The bulk of the refuge—140,000 acres—was made available at no cost by the central and south Florida flood-control district. Known as the Loxahatchee Waterfowl Management Area, it is just west of Palm Beach, Fla. A few hundred acres outside the dike have been acquired or are being acquired with duck stamp funds, to provide farmland for waterfowl-food production and a headquarters site.

The Salt Plains National Wildlife Refuge in north-central Oklahoma, originally established on public-domain land by Executive order, is another good example of a cooperative approach. Shortly before World War II, the Corps of Engineers became interested in the salt flats as a flood-control project. Agreement was reached with the Corps, whereby the salt flats were used for a flood-control impoundment and the additional lands acquired for the project were transferred to the Fish and Wildlife Service for operation as part of the Salt Plains Refuge. Duck stamp funds were used to acquire some 1,029 additional acres needed to round out the refuge. A diversion structure and ditch to supply water for a series of subimpoundments, as well as the dikes and control structures for the subimpoundments, have been financed from duck stamp funds. The 31,000-acre Salt Plains Refuge is now one of the outstanding refuges of the south-central plains wintering area.

The Mud Lake National Wildlife Refuge in Minnesota, an excellent waterfowl-breeding area of more than 60,000 acres, also came to the Service at practically no cost—a few acres had to be purchased to round out boundaries. These lands were originally acquired by the Resettlement Administration. This is one of the few Federal refuges on which moose are found; about 100 head make Mud Lake their home.

In Nevada the famous Carson Sink–Stillwater Slough area of almost 200,000 acres, known to western duck hunters since the beginning of irrigation in Nevada, is now being intensively developed under a joint program by the State, with Pittman-Robertson funds, and the Fish and Wildlife Service, with duck stamp money. All the lands in this project are provided by the Truckee-Carson irrigation district. Draglines and dirt-moving equipment are creating new and improved waterfowl pools and ditches and water-control structures for better water distribution, all of which will guarantee a perpetuation of the sport of duck hunting in one of the finest areas in the West.

When the Denison Dam was constructed across the Red River, boundary between Texas and Oklahoma, it flooded several shallow bays with excellent waterfowl potentials. Two Federal refuges were created: Tishomingo of about 13,500 acres in Oklahoma, and Hagerman of about 11,500 acres in Texas. Subsequent farming and other developments for waterfowl have brought large numbers of wintering ducks and geese into the Red River Valley for the first time within the memory of local residents, and excellent shooting has resulted over a wide adjacent area.

The Santee National Wildlife Refuge on the Santee and Cooper Rivers in South Carolina is a similar area, made available to the Service for wildlife purposes as a part of the Santee-Cooper flood-control and hydroelectric project.

Two of the finest refuges in the South were developed on lands acquired and flooded by the Tennessee Valley Authority. The Wheeler National Wildlife Refuge of some 35,000 acres in northern Alabama and the Tennessee National Wildlife Refuge of approximately 50,000 acres in western Tennessee have become two of the Nation's finest waterfowl wintering areas through the proper management of food and cover.

Purchase of land is merely the initial step in the establishment of a public waterfowl refuge. In addition to the posting and fencing of boundaries, fresh water and food must be provided. Sometimes these operations prove difficult. For example, the famous 50,000-acre Mattamuskeet National Wildlife Refuge in North Carolina looked like a natural area. An abandoned drainage project reverted to its former status as a lake, is one's first impression. The real story is far from being that simple. Old outlet ditches had to be deepened and new ones dug to permit the lowering of water levels in summer to get increased growth of shoreline vegetation. In these moist shoreline flats, willow and other shrub growth had to be eliminated with bulldozers and disks to allow three-square bulrush, a top duck and goose food, to come in.

And the disking had to be repeated every year or two to keep the willows from again taking over. Carp had so infested the lake that they had destroyed practically all of the aquatic food plants. Millions of these rough fish were trapped or seined, and sold, with the result that aquatics are coming back even beyond the greatest expectations.

Mattamuskeet is now one of the most famous waterfowl wintering areas of the Atlantic coast. Here, from 60,000 to 80,000 Canada geese and 80,000 to 150,000 pintails, mallards, black ducks, and teal trade back and forth to adjacent Pamlico Sound and Swanquarter Refuge while hundreds of stately whistling swans—rigidly protected—fly unconcernedly overhead. About 10,000 acres of the 50,000-acre refuge have always been open to public shooting, and hunters normally bag from 3,500 to 5,000 Canadas and a like number of ducks from blinds managed by the conservation department of the State of North Carolina. Hunters on farms surrounding Mattamuskeet account for as many or more geese as are taken on the refuge.

While only a small number of waterfowl areas have had to be purchased in their entirety with duck stamp funds, this source of money has permitted the acquisition of strategic tracts on some 60 areas and the development of many more areas acquired by other means. Up until 1942 good sources of labor for refuge development were available under the Works Progress Administration and Civilian Conservation Corps programs. The big problem was to provide the equipment and materials to go with this labor. Duck stamp funds supplied this need, and with an almost unlimited labor supply, the waterfowl refuge development program on lands obtained primarily from other sources was advanced many years.

FEDERAL AID TO STATE PROJECTS FOR THE RESTORATION OF FISH AND WILDLIFE

Wildlife Restoration

Activities under the Pittman-Robertson program (Federal aid to the States in wildlife restoration) are geared to receipts from the excise tax on sporting arms and ammunition. Revenues were greater than in the preceding year but the carryover was considerably less, and there was a slight decrease in number of projects and in funds obligated. The apportionment was $11,904,903; program participants submitted 740 projects that encumbered $13,358,632. With the States' contribution added, funds for the program amounted to $17,811,509.

To provide wildlife resources for the future and to permit maximum hunting recreation today, investigations by the States were concerned with gathering data on wildlife populations, food conditions, and harvest results. This information provides the basis for setting seasons

TABLE 1.—*Land acquired or in process of acquisition for wildlife conservation purposes under the Migratory Bird Conservation Act, by exchange, and by other acts of Congress, fiscal year 1954*

[In acres]

State and refuge	Acquired			Pending title conveyance
	By other than purchase	By purchase	Total	
Arkansas: Big Lake		161	161	
California:				
Salton Sea				3
Sutter		344	344	156
Colorado: Monte Vista		2,132	2,132	
Florida:				
Chassahowitzka		359	359	3,875
Loxahatchee		1,032	1,032	1,328
Saint Marks		8	8	18
Sanibel				100
Georgia:				
Okefenokee	4		4	
Piedmont	798		798	243
Idaho:				
Deer Flat				59
Snake River	21		21	
Kansas: Kirwin	9,911		9,911	
Maine: Moosehorn		31	31	
Maryland: Chincoteague		323	323	
Michigan: Shiawassee		494	494	2,941
Minnesota:				
Rice Lake		222	222	296
Upper Mississippi		60	60	405
Mississippi: Noxubee	406		406	3,125
Missouri: Mingo				14
Montana: Red Rock Lakes				1
Nebraska: Fort Niobrara		640	640	
New Jersey: Brigantine				48
New York: Wertheim				8
North Dakota:				
Des Lacs	70		70	
Lostwood				490
Oklahoma: Salt Plains				80
Oregon: Malheur	156		156	2,766
South Carolina: Carolina Sandhills				51
Texas:				
Laguna Atascosa		25	25	2,265
Santa Ana				34
Vermont: Missisquoi				750
Virginia:				
Chincoteague				25
Presquile	1,329		1,329	
Washington:				
Columbia		40	40	185
Turnbull	680		680	4
Willapa	160		160	
Wisconsin:				
Horicon		53	53	60
Upper Mississippi	4	7	11	97
Total	13,539	5,891	19,470	19,427

and bag limits and for defining areas to be opened to hunting. Numerous relaxations in hunting regulations have resulted. Several States joined the "two-deer" or "any deer" ranks this year, to accomplish desired herd reductions. Arizona, Colorado, and New Mexico permitted limited harvests of their small, but growing, populations of bighorn sheep, since field studies indicated the desirability of cropping surplus rams.

Each year the States move closer together in resolving mutual wildlife problems. In addition to waterfowl councils, joint mourning-dove studies, and exchange of wildlife for restocking, the most recent move was the creation of a big-game range revegetation committee by the western States that have a common problem.

The Turkish chukar partridge introduction program was completed. Nearly 3,000 birds were flown in from Turkey and liberated in Arizona, New Mexico, and Utah in the 3 years of this experiment. A cautious note of success can be sounded, for there are several reports of reproduction in the wild.

Widely ranging investigative findings, in the form of bulletins, books, and articles in magazines, totaled 446 during the year.

Improvement and restoration of habitat for wildlife again received major emphasis; 36 States carried on this type of work. The trend toward quality rather than quantity was most evident in food and cover planting activities. In many States, the amount of planting stock was reduced, and increased efforts were made to meet habitat requirements with better species and site selection, more attention to proper planting, and adequate care of plantations.

Development of waterfowl areas was under way in 46 States. A number of States are establishing new goose flocks by holding a nucleus for nesting and by providing adequate feeding and resting areas for these birds. Other restoration included the creation of numerous small potholes, many 500- to 2,000-acre marshes, and several major impoundments in the 10,000- to 18,000-acre class.

In the west, considerable work was done on fencing and reseeding suitable browse and forage plants to aid in the restoration of big-game ranges, the protection of watersheds, and the management of all game and domestic species using the lands on which this improvement work is being done. Supplementing these measures was the construction of roads into inaccessible areas to make possible adequate harvests by hunters in localities where too many deer or elk are causing damage to the range. Forest game species on public lands and on private lands under lease to the States have benefited from habitat manipulations which improve food and cover conditions. In several States, cooperation with private and public forestry agencies, by selective logging to save deer-concentration areas, is meeting with much success.

With most of the game ranges fairly well restocked, transplanting efforts continued to decline. Deer and wild turkeys were accorded most of this restoration attention.

The States purchased 88,389 acres of land and leased 139,172 acres for wildlife purposes during the year. In addition, 2,827 acres were acquired for combination fish and wildlife areas. Reflecting in part the increasing scarcity of lands for game, the average price per acre rose from $26.22 in 1953 to $30.09 in 1954.

As usual, acquisitions were made for the benefit of many game species. Western States continued to buy lands for urgently needed big-game wintering ranges. Such purchases were made in new areas as well as in older ones where interior acreages of privately owned lands were acquired.

Fish Restoration

Funds available for financing the Dingell-Johnson program (Federal aid to the States in fish restoration) totaled $4,299,916, a 60-percent increase over the preceding year. This record income was urgently needed because of the demands made by the constantly increasing numbers of anglers for more places to fish and improvement in the quality of fishing. Approval of 301 projects resulted in net obligations for the year of $3,561,017. Projects designed to increase the store of facts useful in carrying out better-planned fish management continued to dominate the program; of the projects approved, 136 made possible the conduct of investigations. Greatest emphasis was on general surveys by means of which the States are making basic inventories of their sport-fishing resources. Detailed studies of a single body of water or of a single species or group of species of fishes characterized another important group of research projects; for example, the careful evaluation of the effectiveness of various types of rough-fish control received important consideration.

One of the essential components of any fish-management program is the collection of information on the harvest of fish. Facts of this kind are to the fish manager what production records are to the manager of an industrial plant; in a sense, they provide a means whereby the success of a State program may be gaged. Studies of this type received substantial attention.

There has been a noticeable increase in attention to marine and anadromous fishes. Of particular significance is the cooperative study of the striped bass, which is being carried out by the Federal and State Governments on the Atlantic coast. Seven States are now engaged in research projects set up as part of an overall fact-finding operation coordinated by the Fish and Wildlife Service and financed in part with Federal Aid funds.

Major attention is being given by the States to the creation of new public fishing waters. Toward that end, construction work was performed on 29 projects to impound more than 2,500 acres of water. These impoundments ranged from 1½-acre ponds to 230-acre lakes. Areas for future development were obtained by 12 States which purchased nearly 3,000 acres of land and water on 35 projects.

Many bodies of water have lost their productive capacity, owing to shifts in species composition. This may mean an overabundance of carp or other inferior fish, or merely an overpopulation with resultant stunting of preferred game species. Frequently, the most efficient method of restoring these waters to peak productivity is to eliminate the entire fish population and then to restock with those species that have demonstrated their ability to supply the fishing demand. Actions of this type were taken on 37 lakes with a total area of 7,500 surface acres. Of particular interest was the reclamation of the James River above the Jamestown dam and reservoir in North Dakota.

There are many waters in the United States that supply very little fishing because it is difficult to reach them. This may be due to the character of the surrounding terrain, or to private ownership that bars entry by the public. To remedy such situations, 34 access areas were acquired or developed with the help of Federal Aid funds during the year.

As a part of its general responsibility for the administration of the program, the Fish and Wildlife Service began the publication of the Dingell-Johnson Quarterly. This publication contains abstracts of reports on current findings from research projects and information on general program status. At the year's end, publication was up to date for the 3 years of program operation. A second number of the circular survey of fishery activities was issued under the title "Survey of Sport Fishery Projects, 1954." This publication summarizes fishery research and management projects being carried out by various governmental agencies and institutions throughout the United States. Reports from 104 agencies, covering 729 projects, were included.

ADMINISTRATION OF FEDERAL STATUTES FOR PROTECTION OF FISH AND WILDLIFE

During the year, Federal-State cooperation in the management of waterfowl was greater than ever. Flyway councils, whose membership includes all State conservation departments, reached full development. These make possible better coordination of flyway programs, with greater mutual understanding of objectives and of the parts to be played by Federal and State agencies, and with minimum duplication of effort. Twelve States contributed 21 employees, and paid their costs, to work with Federal personnel of the United States and Canada in banding large numbers of waterfowl in important breeding areas in Canada. Information from banding returns by hunters will clarify migrational patterns. Progress was made in defining a statistical program to provide detailed knowledge of the mechanics of hunting. All these operations should make for more realistic and biologically sound regulations, and should ultimately permit a more intensive harvest of waterfowl without jeopardizing basic breeding stocks.

Law-enforcement agents of the Service, in cooperation with the enforcement division of the California Department of Fish and Game, completed investigations that put an end to flagrant market-hunting violations in that State. Twelve professional market hunters and seven nightclub and restaurant operators were convicted in Federal court of violations of the Migratory Bird Treaty Act regulations; aggregate sentences were fines of $4,900, jail sentences of 6 years and 9 months, and 7 years probation. The highest individual fine was $1,200 and the longest jail sentence was 18 months. Seven cases involving market hunting or purchase of migratory waterfowl, resulting from these investigations, are still pending.

Officers of the Service cooperated with State conservation-law enforcement men in successfully prosecuting individuals who were commercializing on resident game species. In California, one person was found guilty in State court of selling deer; sentence imposed was a fine of $1,500 and 6 months in jail. In West Virginia, one person was convicted in Federal court of transporting to that State a deer unlawfully taken in Maine; sentence imposed was an $800 fine and 8 months in jail. Fifty-five cases involving violations of the Lacey Act, wherein wild birds or animals were unlawfully taken in one State and transported interstate, were successfully terminated in State court.

Service agents also participated in investigations that resulted in court actions for violations of the Black Bass Act. The first regulations adopted pursuant to the Northwest Atlantic Fisheries Act were enforced by Service agents and resulted in seven convictions in Federal court in Massachusetts.

Amended regulations relating to the importation of birds and mammals will help persons planning to import birds and mammals into the United States for the cage-bird trade, for scientific purposes, and for exhibition in public zoological parks.

Under regulations adopted pursuant to the act of July 17, 1952 (66 Stat. 755), 33 permits were issued to authorize the entry of certain bird skins bearing feathers for use in the manufacture of artificial fishing flies and millinery. Total imports under these permits were as follows: Pheasants, 940; grey jungle fowl, 4,455; mandarin duck, 0.

At the end of the fiscal year the following most common migratory bird permits were in effect: Propagating, 3,055; scientific collecting, 1,675; bird banding, 3,588. Actions in connection with these permits were as follows: New permits issued, 1,465; renewals, 243; amended, 80; revised, 109; canceled, 325; revoked, 254.

During calendar year 1953, 15,404 ducks and 1,638 geese were sold by permittees for propagating purposes, 12,845 ducks and 366 geese were sold for food, and 22,613 ducks and 1,580 geese were liberated. In the same period, 47,001 migratory waterfowl were being reared in captivity. Under experimental-breeding permits, 573 mourning doves, 81 white-winged doves, and 63 band-tailed pigeons were being reared in captivity. For scientific purposes, 17,100 migratory birds, 18 sets of eggs, and 2,202 eggs not in sets were collected.

TABLE 2.—*Summary of penalties imposed for violations of wildlife-conservation laws, fiscal year 1954*

	Convictions	Fines and costs	Jail sentences (days)
Migratory Bird Treaty Act [1]	479	$36,763	[2] 3,145
Migratory Bird Conservation Act	47	1,899	(3)
Migratory Bird Hunting Stamp Act	18	575	(4)
Lacey Act	5	1,050	240
Northwest Fisheries Act	7	950	------
State laws, cooperative prosecutions [5]	4,557	178,318	1,101
Total	5,113	219,555	4,486

[1] In the fiscal year, 522 Migratory Bird Treaty Act cases were disposed of as follows: Convictions, 479; dismissals, 6; nol prossed, 16; adjudged not guilty, 21.

[2] 2,820 days suspended.

[3] 180 days suspended.

[4] 60 days suspended.

[5] Includes 2,314 cases relating to the taking of migratory birds and interstate shipments of game animals and game fishes. In addition to these cases, the Service has not received final disposition on 150 cases involving State game law violations, which were referred to State agencies for handling.

Part of the Pribilof Island fur-seal receipts were again made available for equipment and added personnel for enforcement of the Alaska Game Law. This, together with the excellent cooperation of military authorities, has greatly improved the protection afforded fish and wildlife in the Territory. The recently established patrol station at Tok Junction, entry point of the Alaska Highway, has become one of the more important stations in the Territory. Here, thousands of hunters and fishermen entering Alaska for the first time, on the new highway, have an opportunity to obtain first-hand information about hunting and fishing regulations, and the Service has an opportunity to impress upon newcomers the need for cooperation in obeying the regulations.

Enforcement problems in Alaska are increasing because of new roads, use of surplus military equipment, home-built tundra crawlers, and a new junior-size combination tractor-caterpillar capable of traversing most of the terrain in the Territory. It is also interesting to note that both commercial and private planes in appreciable numbers were flying the back country in search of moose and caribou. It was estimated that, in October 1953, wild game valued at more than $1,000,000 was held in cold storage.

Enforcement officers of the Service contributed to conservation programs in the Territory, by giving instructions in wildlife-resource conservation, sportsmanship, proper handling of firearms, and care of trophies and of game used for food.

During the fiscal year, 221 cases involving violations of the Alaska Game Law were concluded. Fines amounted to $20,067; of these, fines of $2,709 were suspended. Jail sentences totaled 1,950 days, of which 1,380 days were suspended. Seizures included firearms, traps, fishing rods, 80 skins of fur-bearing animals, 63 whole big-game animals, and 440 pounds of big-game animal meat.

RIVER BASIN DEVELOPMENT AND WILDLIFE NEEDS

Of 141 reports this year by the Service on water developments planned by Federal agencies or by private interests under Federal permit, 44 were on Corps of Engineers projects, 40 on Bureau of Reclamation, 6 on Department of Agriculture, and 51 on power projects requiring license from the Federal Power Commission. A number of reports on special studies also were prepared.

In line with the Coordination Act of 1946, general plans have been completed for the use of four reservoir areas for wildlife management. At the Canyon Ferry Reservoir in Montana and the John H. Kerr Reservoir in North Carolina and Virginia, lands have been made available to the State conservation departments for management. At McNary Reservoir in Oregon and Washington several Federal and State areas were established, and at Kirwin Reservoir in Kansas a Federal refuge is being set up.

The Service is giving careful attention to the Bureau of Reclamation's plan for the Garrison Diversion Unit, which contemplates the construction of several reservoirs, with associated facilities, and the irrigation of about 960,000 acres of lands in North and South Dakota. The Service administers 10 National Wildlife Refuges in the area to be directly affected.

Much progress has been made toward preservation of the important sport and commercial salmon fishery of the American River of California. This resource will be seriously affected by inundation of much of its spawning grounds by the Nimbus Dam which is being constructed by the Bureau of Reclamation. The Service and the California Department of Fish and Game have jointly concluded that construction of a hatchery near the dam will be necessary to save the fishery, and funds were appropriated for construction in fiscal year 1955.

In Opinion No. 257 adopted July 29, 1953, the Federal Power Commission denied the application of the Namekagon Hydro Company for a license to construct a dam on the Namekagon River in Wisconsin. The denial was based on the Commission's finding that "The proposed project is not best adapted for beneficial public uses of the Namekagon River, including the use of the stream for recreational purposes." The Fish and Wildlife Service, the Department of the Interior, and the Wisconsin Conservation Commission opposed the project because of the detrimental effects it would have on recreation, including the unique float fishing for smallmouth black bass, and on the scenic beauty of the stream.

The number of major power projects to be investigated by the Service rose sharply during the fiscal year. Some of these proposals are large and complex, with great potential impact on salmon, trout, and big-game resources. Among these are Bruce's Eddy and Penny Cliffs on the Clearwater River of Idaho, Rocky Reach and Wells on the Columbia River in Washington, several sites on the Wenatchee River in Washington, and three sites in and adjacent to Hells Canyon on the Snake River in Idaho and Oregon. These projects are being given continued study with a view to preservation of the highly valuable fish and wildlife resources.

Service biologists kept abreast of reclamation activities affecting marshes, swamps, and seasonally flooded lands throughout the country by drainage, channel improvement, and flood-control programs. Loss of these wetland areas so essential as living space for waterfowl and other wildlife continued, and efforts were strengthened to induce Federal agencies to recognize and protect waterfowl values on such lands involved in the conduct of their programs. Special studies of the effect of agricultural drainage on waterfowl production in the prairie pothole region of the North Central States were completed. A report was sent to the Secretary of Agriculture recommending joint consideration of our findings in order to formulate policies giving greater protection to waterfowl wetlands. Action by the Department of Agriculture on this recommendation has not been completed.

A nationwide inventory of wetlands subject to drainage was completed on June 30, 1954. Included in it are about 65 million acres representing better than 90 percent of all such areas important to waterfowl. These areas are shown on county and State maps, classified by water conditions and native vegetation, and evaluated from the standpoint of their usefulness to waterfowl. The inventory will show other agencies where waterfowl values deserve special protection, and will serve as a basic guide for deciding where and how much wetland habitat should be set aside and managed for waterfowl.

MAINTAINING THE INLAND FISHERIES

More than 17.6 million angling licenses were sold in the 48 States in fiscal year 1953. This indicates the very great interest in the sport of fresh-water fishing which results in tremendous pressure on game-fish populations. In close cooperation with the various State fish and game departments, the Service provides fish for restocking inland waters and furnishes initial stocks of fish for thousands of farm fishponds.

The Service operated 97 fish-cultural stations in 1954. As demands for fish for stocking shift from one area to another, fish production must be shifted, and this results from time to time in discontinuance of operations at some hatcheries and increased activities at others. Management studies have shown the need, at many hatcheries, for species other than those formerly produced. Facilities must be modernized and expanded to produce the large numbers of legal-sized fish that are now required. Congress provided funds for continuing an improvement program at the Hebron, Ohio, station and for continuing the construction of new units at Frankfort, Ky., and North Attleboro, Mass., as well as for repairing flood damage at the Craig Brook, Maine, station.

Since pioneer days, the salmon resource has been important to the economy of the Pacific Northwest and Alaska. Maintenance of this renewable resource has become increasingly difficult because of population increases and industrial development. Hydropower, irrigation, and flood-control dams have impaired the salmon populations; and construction of many more dams proposed, particularly in the Columbia River, will result in further damage to the resource. To counteract the anticipated damage so far as possible, the Fish and Wildlife Service, cooperating with the States of Oregon and Washington, undertook the maximum development of salmon productivity in the lower Columbia area. Construction phases of this program, started in 1949, are about half completed, and some beneficial results already are apparent.

As a result of the construction of Grand Coulee and Shasta Dams on the upper Columbia River and on the Sacramento River, the Service initiated projects designed to mitigate damage to the salmon resources. These programs have been very successful.

Of particular interest is the development by Service biologists, with the cooperation of Bureau of Reclamation engineers, of a new type of fish-screening device, in connection with the Delta-Mendota irrigation canal in Central Valley, Calif. It will prevent the loss of fish in the canal and can be constructed at a much lower cost than the usual device. Tremendous savings are anticipated from the installation of this device in the many existing and proposed canals that affect fish populations.

Trout fishing has continued to grow in popularity, and increased production of legal-sized trout has become necessary to maintain the fishery. The studies on trout nutrition and the training program for trout culturists conducted at the Cortland, N. Y., fish-cultural station have been important factors in producing greater numbers of trout at a lower cost, as have the expansion and improvement of facilities at a number of trout hatcheries in strategic locations where the water supply is adequate and of good quality. Trout diseases have continued to be a problem at a few hatcheries; studies have disclosed the effectiveness of several new drugs in controlling these diseases.

The Service program of assistance to Defense and Veterans Administration installations has developed rapidly during the year. Fishery-management biologists assisted more than a dozen VA hospitals, bringing the total number of these installations contacted to about 140 (almost all of those active). Continuing fishery-management programs are in effect at about a third of the establishments. In the past year, 10 Air Force bases and 30 Army establishments received assistance, and other military areas are included in 9 continuing programs; cooperative assistance to Navy, Marine, and Coast Guard installations lagged by comparison, but 15 of these were brought into the program. Increase in the number of requests for fishery-management assistance indicates a growing interest in this program.

Fishery-management assistance has been given to some 20 Indian Reservations, where cooperation with tribal councils is expected to result in greatly improved conservation practices. Several Fish and Wildlife Service Refuges were added in the past year to the 20 that previously received continuing aid in fishery management. An intensive pilot program directed toward comprehensive management planning for the development of lake and stream fisheries is being conducted on the Green Mountain National Forest in Vermont.

The dissemination of information on farm-pond management is being stressed, through cooperation with Department of Agriculture field agents, lectures, demonstrations, correspondence, literature, and related extension activities.

Better techniques in fishpond management are greatly needed. Service fishery-management biologists cooperate closely with State conservation departments and other research units in developing new management techniques. A number of ponds at the Hebron, Ohio, warm-water hatchery have been made available for study of pond stocking and management techniques, by personnel of the State of Ohio; a Service biologist at Hebron is conducting complementary field trials of stocking formulas in many farm ponds in the State.

In table 3 is a summary of production by Federal hatcheries for calendar year 1953. Table 4 shows land acquisition for Federal hatcheries in fiscal year 1954.

ADMINISTRATION OF ALASKA FISHERIES

Management of the Commercial Fisheries

The commercial fisheries of Alaska, under regulatory control and protection of the Fish and Wildlife Service, saw a step-up in patrol and in numbers of stream guards.

Fishery-conservation activities during the calendar year 1953 were administered by 33 fishery-management biologists and enforcement agents, 9 game-management agents detailed from the States, 150 stream guards and patrolmen, 12 seasonal employees of the Alaska Depart-

TABLE 3.—*Fishes and fish eggs distributed, calendar year 1953*

	Eggs (number)	Fry (number)	Fingerlings		Fish 6 inches or larger		Total weight, finger-lings and larger	Total number, fish and fish eggs
			Number	Weight	Number	Weight		
				Pounds		*Pounds*	*Pounds*	
Largemouth bass		591, 560	11, 300, 940	30, 205	10, 295	1, 503	31, 708	11, 902, 795
Smallmouth bass		483, 000	97, 320	313	100	225	538	580, 420
Bluegill			36, 921, 285	55, 589	8, 575	1, 353	56, 942	36, 929, 860
Redear sunfish			650, 840	1, 321	1, 330	105	1, 426	652, 170
Black crappie			350	7			7	350
White crappie					815	120	120	815
Channel catfish		156, 000	272, 815	2, 140	14, 510	619	2, 759	443, 325
Bullhead			349, 595	2, 312			2, 312	349, 595
Yellow perch			1, 750	12			12	1, 750
Walleye		3, 396, 500	694, 450	749	305	62	811	4, 091, 255
Northern pike		4, 090, 000	206, 760	877	520	52	929	4, 297, 280
Cutthroat trout	7, 469, 415	373, 000	2, 333, 600	9, 820	66, 510	9, 114	18, 934	10, 242, 525
Rainbow trout	9, 183, 240	80, 000	6, 796, 590	86, 178	2, 033, 195	326, 968	413, 146	18, 093, 025
Kamloops trout			51, 780	2, 420			2, 420	51, 780
Beardsley trout			15, 865	198	1, 535	583	781	17, 400
Steelhead trout			116, 815	2, 341	78, 485	9, 339	11, 680	195, 300
Lake trout			572, 635	6, 934	8, 890	1, 072	8, 006	581, 525
Brook trout	5, 926, 780		3, 197, 105	31, 137	674, 930	142, 925	174, 062	9, 798, 815
Brown trout	3, 773, 325	225, 000	1, 305, 885	15, 443	454, 365	109, 021	124, 464	5, 758, 575
Grayling	1, 708, 910		10, 525	276			276	1, 719, 435
Chum salmon		4, 650, 760	202, 685	346			346	4, 853, 445
Silver salmon	4, 340		893, 875	16, 283	90, 005	6, 018	22, 301	988, 220
Red salmon	1, 470, 715		1, 434, 565	10, 895	32, 690	2, 040	12, 935	2, 937, 970
Kokanee		7, 204, 200	190, 000	48			48	7, 394, 200
King salmon	11, 785, 315	11, 658, 645	81, 600, 175	282, 687			282, 687	105, 044, 135
Atlantic salmon		91, 435	185, 280	4, 059	4, 370	406	4, 465	281, 085
Sebago salmon		25, 435			17, 500	537	537	42, 935
Total	41, 322, 040	33, 025, 535	149, 403, 485	562, 590	3, 498, 925	612. 062	1, 174, 652	227, 249, 985

ment of Fisheries, and 68 fishery aids. A fleet of 6 vessels, 23 boats, and 155 outboard skiffs provided transportation, and 11 airplanes logged 2,800 hours of flight time.

There were 109 cases of violation of the Alaska fishery laws, and 220 individuals and 2 companies were prosecuted. Defendants in 90 cases were found guilty, 7 were acquitted, and 12 were dismissed. Fines totaling $25,911 were levied against the operators of 31 purse seines, 50 gill nets, 3 beach seines, 5 traps, 1 troller, 2 hand rods, 11 snag hooks,

TABLE 4.—*Land acquired or in process of acquisition for fish-cultural stations, fiscal year 1954*

[In acres]

State and station	Acquired			Pending title conveyance
	By other than purchase	By pur-chase	Total	
Georgia: Warm Springs				1
Mississippi: Lyman		30	30	
Nebraska: Crawford				1
Oregon: Eagle Creek		126	126	
Tennessee: Erwin		1	1	
Washington:				
Carson	220		220	
Spring Creek				6
Total	220	157	377	8

3 spears, and 2 guns; of these, fines totaling $5,110 were suspended. In addition, 4,055 days of jail sentences were imposed, of which all but 85 days were suspended. Sales of confiscated fish netted $4,547.69.

In 1953, 24 weirs were operated to determine the timing and volume of salmon runs, or 7 more than in 1952; 10 were in southeastern Alaska, 9 in central Alaska, and 5 in western Alaska. The success of spawning survival was again measured by downstream-migrant sampling weirs.

Pribilof Islands Fur-Seal Industry

During 1953, 66,669 fur-seal skins were taken on the Pribilof Islands, as compared with 63,922 for 1952. Under the terms of the Provisional Fur-Seal Agreement of 1942, the Canadian Government received 13,334 sealskins, or 20 percent of the season's take. The byproducts plant on St. Paul Island produced 353 tons of fur-seal meal, 31,620 gallons of blubber oil, and 15,180 gallons of carcass oil, which sold for the gross sum of $50,974.25.

Two public auctions of fur-seal skins were held at St. Louis, Mo., during the fiscal year 1954. On October 5, 1953, sale of 27,113 skins brought $1,944,920. On April 12, 1954, sale of 25,038 skins brought $2,301,646; at the same time, 39 Pribilof Islands blue-fox skins sold for $291.50. In addition, a few sealskins were sold during the year for promotional purposes.

UTILIZING THE COMMERCIAL FISHERY RESOURCES

The commercial catch of fish and shellfish for the United States, including Alaska, in the calendar year 1953 was about 4.4 billion pounds and was valued at about 345 million dollars.

New beds of deep-water red shrimp in the Gulf of Mexico were discovered by the exploratory-fishing vessel *Oregon*. These now appear almost certain to become of commercial importance. The *Oregon* also made an important discovery of yellowfin tuna in the western gulf. Exploratory cruises are planned to determine whether the yellowfin resource would support a new commercial fishery.

More bluefin-tuna exploration in the Gulf of Maine and adjacent waters off New England indicated the possibility of establishing an annual fishery for this species. A cooperative test of bluefin fishing on a commercial scale by a tuna seiner from the Pacific coast is planned for the summer of 1954.

In Alaska, the vessel *John N. Cobb* explored new winter fishing grounds for herring, bottom fish, and shellfish in the Prince William Sound area. Exploration of the same grounds in the summer of 1954 will provide a seasonal picture of the potential available fisheries that can be developed locally.

Preliminary extensive experiments in midwater trawling were completed. New data on noises produced by fish and shrimp were revealed by underwater-listening experiments—part of the program of electronics research on methods of fish detection.

An economic study of the freezing-fish-at-sea process indicates that the method is commercially feasible. This process, designed primarily to improve the quality of domestic fish fillets, involves freezing whole fish aboard ship for later thawing, filleting, and refreezing ashore. Application to species of fish other than haddock, such as ocean perch, cod, hake, whiting, and pollock, is planned.

Fish meals and solubles were analyzed for proximate composition and content of the various B vitamins to determine the nutritive value of these products for feeding farm animals and poultry. These data will be integrated with information obtained by further research, to develop a chemical index for the feeding value of fishery byproducts.

Substantial industry interest was expressed in the development of voluntary Federal grade standards for fishery products. Grade standards raise the general quality of food products offered to consumers and assist in efficient marketing. Suggested standards for haddock fillets have been prepared. Studies were instituted and are being continued on standards for canned Maine sardines and frozen fish sticks.

Home economists of the Service in cooperation with 9 States conducted 123 fish-cookery demonstrations for school lunchroom personnel; 12 for homemakers, institutional managers, and educational groups; and a small number at "workshops" held at summer-school sessions and at other special meetings. Increases of up to 80 percent in the use of fishery products in school lunchrooms are attributed to this program.

Continued emphasis was placed upon stimulating the sale and distribution of frozen fishery products through locker plants.

Monthly and quarterly analyses of the fishery-supply situation were prepared for restaurants, food chains, associations, and Government agencies. A monthly technical abstracting service on commercial fisheries was continued.

Service-produced fishery educational motion pictures were distributed through 60 film libraries. A shrimp-fishery motion picture is in final stages of completion, and negotiations have been completed for an educational motion picture depicting the use of outboard motors in the commercial fisheries.

Assistance was given to public and private groups concerned with the development of markets for new products or for species of fish not being fully utilized.

On the authority vested in the Department by the Fishery Cooperative Marketing Act of 1934, regulatory activities and reports concerning fishery cooperative-marketing associations were continued. As of June 30, 1954, there were 81 active fishery cooperative-marketing associations in the United States and Alaska as compared with 73 a year earlier.

Information on fishery marketing, transportation, and international trade problems was assembled. Fish consumption, increased charges for icing carload shipments of fresh and frozen fish, and imports of groundfish fillets were just a few of the subjects in these fields.

A detailed summary of economic aspects of the scallop industry was made. A survey of fishery marine insurance was begun in an effort to analyze industry insurance problems.

General statistical surveys for 1952 data were completed for all sections of the United States except the Mississippi River and its tributaries. Similar surveys for 1953 data were begun.

Monthly and annual bulletins on the landings of fishery products in Maine, at principal Massachusetts ports, and Florida, and monthly bulletins on landings in New Jersey, Mississippi, and Texas were continued. Issuance of a monthly bulletin on landings in Alabama was resumed after a lapse of more than 2 years, and publication of a monthly report on landings in the marine district of New York was begun. Monthly bulletins were released on domestic freezings and holdings of fishery products, the production of fish meal and oil, documentation of fishing vessels, and United States foreign trade in fishery products.

Since the production of fish sticks is creating a new extensive market for fish, surveys were conducted to determine the growth of the fish-stick industry in 1953 and the first quarter of 1954.

Responsibility was assumed for certification of legal ottertrawl cod ends used in the New England groundfish fishery, in accordance with the regulations adopted under the provisions of the International Convention for the Northwest Atlantic Fisheries, and for conducting a study of the changes in mesh size in cod ends.

Operation of seven Fishery Market News Service field offices at Boston, New York City, Hampton (Va.), New Orleans, San Pedro, Seattle, and Chicago was continued. Because of the phenomenal development of the fish-stick industry, additional coverage of prices for processed fishery products in consumer-size packages was started. Current production and marketing information on fishery products was collected and compiled by full-time and part-time marketing specialists in fishing and distribution centers throughout the country and Alaska. Fishery Market News information was used extensively by all phases of the fishery industries and in a number of Tariff Commission and congressional hearings. The field offices aided Selective Service in recommendations for occupational deferment of men employed in the fisheries.

The monthly *Commercial Fisheries Review* featured articles on the fisheries, news of trends and developments in domestic and foreign fishery industries, and Government orders affecting fisheries. The demand for this magazine increased considerably to a total of almost 4,000 subscribers.

CONTROLLING DAMAGE BY ANIMALS

Predators and rodents seldom interfere with man's interest in a wilderness habitat, and serve a purpose as members of the plant and animal communities. The situation is quite different when such animals live in close proximity to cultivated crops, livestock, and other resources developed for human needs. Then, they compete with man for products of the soil. When they become too numerous and cause severe economic losses, local control becomes necessary.

Desired reductions of mammals or birds can often be accomplished by making changes in farming practices to affect their two basic requirements—food and shelter. Where such practices prove to be inadequate or impractical, more drastic measures must be employed, including the use of repellents, scare devices, traps, and lethal materials. The development and careful application of these management tools is a long-established practice of the Service and grows in importance as the demands of civilization increase.

Predator-Control Activities

During the year, predatory-animal control activities were carried out by the Service in cooperation with 16 Western States and Alaska. In practically all cases of losses to livestock, poultry, and game by wolves, coyotes, mountain lions, bobcats, and bears, such depredations were greatly reduced by the prompt action of Service and cooperative hunters.

A statement by a Wyoming county official indicates the benefits derived from these control activities: "The longest single step we have taken * * * in the last 10 years is the practice of pasture grazing. By this method, we have cut the cost of producing wool and lamb considerably. To make this practice practicable, the control of predatory animals is absolute necessary. * * * This program has been very effective and, in my estimation, has been largely responsible for keeping the wool-growing industry from disappearing from this county. * * * The antelope and the deer have increased threefold since the coyote has stopped taking the toll from the fawns."

Approximately 4.1 million cattle and sheep graze on western forests, and some 20,000 permittees annually pay more than 4 million dollars in fees to land-management agencies. Protection of this livestock from predatory animals is an important phase of the Service's control operations. The effectiveness of the work on the Fish Lake National Forest in Utah, for example, is illustrated by data furnished by the forest supervisor for the calendar year 1953, when a loss of only 135 sheep was reported, as compared with a loss of 4,045 sheep in 1946. Savings of forage by open herding of sheep and labor savings during that period were also appreciable.

Somewhat similar control work was carried out in Alaska to prevent serious loss of big-game animals, particularly caribou and reindeer. While these losses are usually not critical among large, well-established herds of big game, they are a deciding factor in survival among herds that have been depleted to a point approaching extermination. Such a situation was illustrated in the Escholtz Bay reindeer herd on the Seward Peninsula. A pack of 7 wolves killed at least 100 deer from this herd between October 1 and November 20; they did not kill poor animals but preferred the fat females. Further losses were prevented by control measures.

Rabies incidence in wildlife continued high, with a consequent loss of hundreds of domestic animals. In 1953, 1,475 laboratory-proven cases of rabies were reported by the various States (mostly east of the 100th meridian), with Texas alone reporting 204. Foxes and skunks were the main carriers. Reported cases of rabies in domestic stock for 1953 totaled 1,122, with a grand total of 4,945 for the 5-year period 1949–53. Reported cases probably represent less than 10 percent of the actual incidence; hence, the disease loss to farmers has been tremendous. Suppressive measures were recommended and demonstrated to the public to the limit of the Service's resources.

Coyotes were controlled in sparsely settled western range areas through use of compound-1080 stations and "coyote getters," and in thickly populated communities by traps, "coyote calls," and den hunting. Bobcats continued to increase and required intensified trapping in several States. In western Washington and northwestern California, control operations were carried out on bears which severely damaged young redwood, fir, and other valuable trees. Assistance was given to many Western States where occasional livestock losses by individual stock-killing bears were encountered, and to an Eastern State in reducing bear numbers around State-park campsites.

Rodent-Control Activities

Few commodities used in the average home are unaffected by rats and mice, and these two rodents, without doubt, cause greater damage than do all other forms of wildlife. During the year, the Service and local agencies carried out numerous programs to control these pests. Data from many areas revealed rodent filth in practically every major commodity raised for food. Contrary to popular belief, rats were not always the prime offender; for instance, there were indications that house and field mice caused more contamination in wheat. Examination of grain taken directly from combines in harvest fields disclosed mouse droppings in an appreciable percentage of samples. A survey by the Food and Drug Administration gave evidence of rodent filth in 90 percent of over 1,000 samples of corn taken at terminal markets; much of this filth originates in the huge stocks of agricultural commodities held in storage on farms and in country elevators. Such raw grain must be protected from these rodents if the Nation is to have filth-free materials for the manufacture of its food.

Work was also conducted on controlling field rodents. Much of this concerned pine and meadow mice, which damage roots and trunks of fruit trees in the Northeast, Midwest, and Pacific Northwest. The white-footed mouse continued to handicap reforestation programs, especially in Oregon and Washington. Direct control operations against these mice have been carried out on over 241,000 acres of cut-over and burned-over land in Oregon since 1950. In addition to limited use of compound 1080, the new repellent poison "tetramine" was employed with promising results. Destructive rodents of lesser importance in such areas included porcupines and pocket gophers. The small brush rabbit of western Oregon proved a serious threat to Douglas-fir plantations. In one nursery, some 250,000 seedlings suffered about 30-percent damage within 1 month. Increased efforts to prevent such losses were directed toward use of repellent substances.

The anticoagulant poisons, warfarin and pival, were used extensively in commensal-rodent control operations. A combination of cereal and water baits containing these materials proved effective for destroying large numbers of rats and mice under many types of conditions. An estimated 3½ million rats are born each day in the United States, however, and it is fallacy to place sole reliance on poisons to control rats and mice. Successful control must include basic management practices that limit their food and shelter; sanitation and ratproofing of buildings continue to be necessary.

Summary

Cooperative predator and rodent control operations during the year entailed expenditures of $929,000 from regular departmental appropriations, supplements by $1,288,196 from cooperating States and $3,129,952 from cooperating counties, livestock associations, and others. The recorded catch of predatory animals by Service and cooperative personnel was 52,636 coyotes, 1,682 wolves, 19,559 bobcats and lynxes, 860 stock-killing bears, and 232 mountain lions. In rodent-control operations, 9,246,674 acres of land were treated for elimination of prairie dogs, ground squirrels, pocket gophers, jackrabbits, field mice, cotton rats, kangaroo rats, porcupines, woodchucks, and moles. In addition, 383,499 premises were treated in cooperative campaigns for the control of rats. Special equipment and supplies used in both predator and rodent control, and 284,987 pounds of rodent-bait materials, were distributed by the Service's supply depot at Pocatello, Idaho.

INTERNATIONAL COOPERATION IN CONSERVATION

The problem of producing more and better food for a rapidly expanding population is worldwide. Many countries have had an inadequate diet for a long time, and their outlook for the future is questionable. Marine products are important elements in improving the dietary because they are rich in proteins, vitamins, and minerals. If marine resources are to make their maximum contribution to meeting future needs, steps must be taken to (1) maintain them at the highest level of productivity, and (2) improve the methods of capture, preservation, transport, and marketing. The United States is helping to solve this problem in two ways, through international conservation agreements and through international technical cooperation.

International Conservation Agreements

During the fiscal year 1954, the Service participated in the activities of several international fishery commissions.

The International North Pacific Fisheries Commission, established by the International Convention for the High Seas Fisheries of the North Pacific Ocean, signed in Tokyo on May 9, 1952, held its first meeting in Washington in February 1954. The Director of the Service is one of the four United States Commissioners. Although the first meeting was organizational in nature, the Commission made notable progress toward the development of research programs for the convention area. The Commission's Standing Committee on Research and Biology met in Tokyo in May 1954; scientists of the Service attended the meeting.

The International Commission for the Northwest Atlantic Fisheries held its fourth annual meeting in Halifax, Nova Scotia, in June 1954. An Assistant Director of the Service is one of the three United States Commissioners. Of first importance during the meeting was a review of research during the last year under the comprehensive research program for the convention area. Significant progress has been made in hydrography, and in research on redfish and haddock.

The International Pacific Salmon Fisheries Commission met twice during the year, continuing its work on the restoration of the sockeye-salmon runs of the Fraser River. Rapidly increasing runs have made it possible for the Commission to extend the open season on sockeye salmon during the 1954 season. An Assistant Director of the Service is one of the four United States Commissioners.

The Inter-American Tropical Tuna Commission continued its research on the tunas of the eastern tropical Pacific Ocean. Panama adhered to the convention on September 21, 1953, and thus became a member of the Commission. The Director of the Service is one of the four United States Commissioners.

The new International Pacific Halibut Convention, signed on March 2, 1953, was ratified and entered into force on October 28, 1953. An officer of the Service is one of three United States Commissioners on the Commission established by this convention. It is expected that the additional regulatory powers granted the Commission will result in an increased catch of 1,000,000 pounds during the 1954 season.

The Indo-Pacific Fishery Council held its fifth annual meeting in Bangkok in January 1954. An officer of the Service was United States delegate to this meeting. The Council continues to make progress in the development of the fisheries of the Indo-Pacific area and in the exchange of information among the 15 member governments.

The International Whaling Commission did not meet during the fiscal year, but the annual meeting of 1954 is scheduled for July in Tokyo.

International Technical Cooperation

The Fish and Wildlife Service continued to assist in carrying out the program of technical assistance to friendly foreign nations by cooperating closely with the Foreign Operations Administration. During fiscal year 1954, technicians were engaged in fishery-development projects in Mexico, El Salvador, Ecuador, Peru, Liberia, Egypt, Iran, Pakistan, India, and Indonesia, and a preliminary study was made of trout waters in Panama.

In Mexico, a great shrimp fishery has developed in the past decade, providing a new and large source of food and of income to the fishermen. The resource has been exploited so heavily that conservation is already a serious problem. There is need for increased production and improved distribution of fish for domestic consumption.

In El Salvador, plans are being formulated for a modern fishing industry based upon explorations and surveys made in the past 2 years. Peru has made a number of advances in administration of fish and wildlife resources, and in providing improved facilities for the fishing industry. A fishery terminal in Lima was established to permit large-scale refrigeration and storage, thus ensuring more effective use of surplus catches.

In Liberia, numerous farm ponds have been constructed at a considerable distance from the coast, and the prospect for further development of pond fisheries is good. There has been a remarkable increase in production from the sea in Liberia, in large part as a result of the activities of fishery technicians.

In Iran and Egypt, development of the fishing industries is still in the planning stages. In the fishing industry of India, notable progress has been made in mechanizing vessels and shore facilities, in addition to general development. Attention is also being directed toward the extensive fisheries of inland waters. In Indonesia, a program of development has been carried on for the past 3 years, with some success, and plans have been prepared for a much larger program in the future.

Parallel with the demand for fishery development and industrialization has come a greater realization in many countries of the need for training of their own people. As a result, students are being sent to the United States for training in fishery science and technology in increasing numbers.

During the past fiscal year, 9 countries sent 33 participants for training in 11 different technical branches of the fisheries. Seventeen students of various branches of fishery technology came from Cuba, India, Indonesia, Iran, Pakistan, and Thailand. Seven students of fishery biology (marine and fresh water) came from China (Formosa), India, and Pakistan, and four in fish culture came from China, Iraq, and Thailand. Indonesia and Thailand sent four students of fishery administration and statistics, and one came from South Africa for studies in the management of seal resources. Training periods varied from a few months to a year and often included university studies and extensive tours of fishing-industry centers.

National Park Service

Conrad L. Wirth, *Director*

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THE National Park Service is responsible for the conservation and regulated use of the Nation's outstanding scenic, scientific and historic areas. For the past 38 years, the Service has guarded these precious resources by careful management, progressively improved operation, well-trained personnel, and by fostering public understanding and appreciation of the areas.

In the past year, as in each succeeding year since World War II, the value and usefulness of the national parks to the American people became increasingly evident. The people are the owners of these irreplaceable resources, and their growing realization of the richness of their heritage is ever more apparent as the visitor count spirals into the tens of millions. In 1953 visitors exceeded 46,000,000—an increase of 112 percent in 7 years.

Whole families go to the parks together, to camp, to play, to find in them refreshment, enjoyment and spiritual sustenance. It is a wholesome and encouraging trend. To the National Park Service it presents a challenge of great magnitude. The safeguarding of America's primeval wildernesses and significant historic sites while making them available to great numbers of people is of paramount importance.

For some years, emergency demands for funds and personnel have taken precedence and appropriations have been far short of the amounts needed for upkeep of the parks and to properly care for this heavy visitor load.

Early in the fiscal year, while organizational changes were being introduced, Secretary McKay alluded to the problem in a public speech:

> We have been compelled to admit that, since the war, appropriations have not been sufficient to enable the National Park Service to provide development in proportion to the vastly increased volume of public use. We want to provide the kind of service which enables the visitor to get the maximum enjoyment from his park experience.

> I believe that the reorganization of the Service now being put into effect * * * is going to help it perform its varied tasks more effectively. However, I do not delude myself into thinking that the reorganization of an agency which was already functioning with a high degree of efficiency, and whose employees are widely hailed for their dedication to their work, is the whole answer.
>
> I can only say * * * that I am hopeful that the time may not be far distant when other demands on the Treasury, which have had to be given high priority, will lighten enough so that more liberal and more nearly adequate provision may be made for the needs of the National Park System.

The Congress has been sympathetic, too, and was able to brighten the picture somewhat at the beginning of the new fiscal year by a special fund allotment for additional seasonal personnel for the summer of 1954. Some alleviation of the critical road-deterioration problem was also in view as the year ended, with provision in the 1954 Federal Aid Highway Act for additional construction funds.

However, in the nearly 9 years since the end of World War II there has been almost no provision of additional facilities to meet the vast increase in number of visitors. The tremendous backlog of roads and trails, and buildings and utilities projects, remains little changed; it has, in fact, grown rather than decreased. Facilities as a whole are so inadequate, and largely obsolescent, as to have caused a large volume of comment from magazines and newspapers during the year.

In many of its activities, the Service achieved substantial progress during the 1954 fiscal year. The land acquisition program moved forward with the help of State and private sources, some 93,000 acres of nationally significant lands were added to round out authorized park boundaries. A new area, historic Fort Vancouver, became a full-fledged national monument; another, George Washington Carver National Monument, was dedicated in honor of a great American.

Through the beneficence of public-spirited citizens and organizations, the Service was enriched by some $454,000 for specific park purposes and a great amount in lands, properties, and historic artifacts. A donation in excess of $209,000 from the General Federation of Women's Clubs for furnishings at Independence Hall; of $82,000 from the Old Dominion Foundation for land acquisition at Wright Brothers National Memorial and $25,000 from the same source for a Cape Hatteras research study; $10,000 from Moses H. Cone Memorial Hospital for the Moses H. Cone Memorial Park—these examples could be multiplied. The famous Fuller arms collection, appraised at $250,000, was donated and installed at Chickamauga; John D. Rockefeller, Jr., was about to add $500,000 for land acquisitions to previous contributions.

Excellent progress was made in utilizing commercial facilities as substitutes for park-operated utilities with improved service and substantial savings achieved. Park visitor-fees were adjusted in line with higher costs to bring additional revenue. And a major highlight was the progress in encouraging private capital investment in improving and increasing public accommodations for park visitors; millions of dollars in private capital was thus being invested by the end of the year, adding appreciably to the facilities needed so acutely both for today and tomorrow.

REORGANIZATION

One of the major results of a study, during 1953, of the organization and functioning of the National Park Service, by a Management Study Committee appointed by the Secretary, was a reorganization of both the Washington office and regional offices, establishment of two branch offices for design and construction, and the delegation of a much greater degree of administrative responsibility to those in charge of field areas. One recommendation, growing out of the findings of the committee, which would have increased the number of regional offices to 6 from the present 4 has had to be deferred because of a mandate of the two appropriations committees of Congress that limited the use of general administrative funds to the Washington office and the existing regional offices. The committees also asked that the Department study the possible desirability of abolishing the Region 1 office and transferring its functions to Washington.

In the Washington office, the changes resulted in a reorganization providing for 2, rather than 3, assistant directors. The assistant director in charge of administration supervises the branches of finance, office services, personnel and safety. The assistant director in charge of operations supervises the branches of concessions management, lands, forestry, a new branch of programs and plans control and a new maintenance section. The chief of the Audit Branch is made directly answerable to the director, and the staff of the chief counsel has been transferred to the Officer of the Solicitor.

In addition to the previously existing Division of Design and Construction, two new divisions have been established. Interpretation includes the branches of history, information, natural history, and museums. A new Division of Cooperative Activities includes the branches of area investigations, river-basin studies, and State cooperation. Also directly under the director is a new assistant concerned principally with management improvement.

All the detailed functions of design and construction are now centered in two branch offices of design and construction, in Philadelphia and San Francisco, which began functioning on June 1. The four regional offices, with their reduced staffs, have been delegated much of the authority formerly exercised by the director, and most of this has, in turn, been redelegated to those in charge of field areas, in varying degrees, depending largely on the adequacy of area staffs. A number of technicians, formerly on regional office staffs, have been transferred to field areas where, as a rule, they serve two or more areas.

TRAVEL IN PARK AREAS

The dynamic growth of our population is reflected in the heavy travel in park areas. The upward trend that has marked the past 7 years continued, with 46,224,794 visitors recorded in the 1953 calendar year as against 42,299,836 in 1952—an increase of nearly 4,000,000. Natchez Trace Parkway, included for the first time in the report, accounted for about one-third of the overall increase. Eleven areas attracted more than 1,000,000 visitors each. Of these, Blue Ridge Parkway recorded 4,266,975 visitors; 2 other areas had more than 2,000,000 each.

In addition to the visitors reported above, the National Capital Parks, exclusive of national memorials, had a total of 6,043,386 visitors in 1953.

Public interest in reports.—The statistical records on park visitors collected, compiled, and maintained by the Service are being used by private enterprise at an increasing rate as sources of information. During the year, the monthly reports were distributed regularly on requests to business and trade organizations, advertising agencies, public libraries, universities, newspapers, magazines and individuals.

Travel surveys.—Progress continued on the travel surveys of national parks started some years ago to obtain much needed information on travel habits and expenditures of park visitors. The findings provide data that are of assistance to the Service in managing and developing the parks and in evaluating economic benefits derived therefrom. The Bureau of Public Roads and State highway departments cooperate with the Service by conducting the surveys, with the assistance of park personnel. Such surveys have been completed for 4 national parks and 3 more are in various stages of completion. The Virginia Highway Department prepared a report, now being published, on findings in the Shenandoah National Park survey, field work for which was completed in fiscal 1953. Field work on the Yosemite National Park survey, in which the California Division of Highways participated, was finished in October 1953. The data obtained were being analyzed, to be followed by preparation of the report. The newest survey, of Grand Canyon National Park, was initiated last February, and field work was scheduled for completion in October 1954. The Arizona Highway Department is participating in this survey. An interim report on the sampling of winter use was released, and will be followed by those on other seasons as work progresses.

Distinguished park visitors.—President Eisenhower visited Abraham Lincoln National Historical Park on April 23, toured the park and gave a brief speech. King Paul and Queen Fredrika of Greece visited Muir Woods National Monument, Calif., Grand Canyon National Park, Ariz., and the Home of Franklin D. Roosevelt in November 1953. The latter was also visited by President José Antonio Renón of Panamá, Emperor Haile Selassie of Ethiopia, and Crown Prince Aitihi of Japan. President Celal Bayar of the Republic of Turkey was a visitor at Lake Mead National Recreation Area.

Safeguarding the visitor.—Efforts were increased during the year to insure greater visitor safety in the park areas through careful planning, training of personnel and cooperation from the Red Cross, Public Health Service, and other agencies. Also, efforts to increase visitor safety-consciousness were continued by rangers, naturalists, and other field personnel through both printed and spoken warnings against possible hazards. There was a slight increase in visitor fatalities, from a rate of 1.04 per million visitors in the 1952 calendar year to 1.08 in 1953. Of the 50 visitor fatalities reported, 22 were from motor vehicles, 19 from drownings, 6 from falls, and 3 from other causes.

IMPROVEMENTS IN PUBLIC ACCOMMODATIONS

A major achievement of the year was the progress made in encouraging private capital investment in public accommodations to serve the millions of park visitors. The accomplished concessioner contracts and permits represent careful and detailed study as to how the needs and demands of the visiting public can be met with encouragement and protection to the investment involved. Improvements of concessioner-operated facilities underway or planned will be of immeasurable help in providing for greater public enjoyment of national park areas.

Contracts.—The Service entered into 16 new concession contracts and 8 extensions of existing contracts. Of the new contracts, 3 were fully executed; 2 were under review by the Congress in accordance with requirements of the act of Congress of July 31, 1953, and 11 were being processed for transmittal to the Congress. Six of the 8 extensions were fully executed, one was before the Congress and one was being readied for transmittal. Forty-five concession permits were handled of which 34 were completed, one was under review by the Congress, and 10 were in process for review. Ten subconcession agreements covering a wide variety of incidental services were approved.

Construction and improvement of facilities.—At Grand Teton National Park, where travel had increased 509 percent over 1946, the Grand Teton Lodge & Transportation Co. launched a program for development of public facilities which is expected to involve an investment in excess of $5,000,000. Here construction of a three-story main lodge and 256 cabins at Jackson Lake had progressed to the point where 150 cabins were opened to the public on June 13, 1954, months ahead of schedule. The lodge, remaining cabins, stores, cafeteria, service stations and other facilities are expected to be completed for use in time for the 1955 travel season. In the Colter Bay area, the company will place some 200 log cabins, a 112-site trailer area, commercial-service buildings and employee residences. The Service was developing the 229-site campground, providing roads and parking areas, and installing a utility system for the park areas.

In another concessioner development, at Yosemite National Park, the Yosemite Park & Curry Co., built a new store and grill and reconstructed Big Trees Lodge at Wawona and was anticipating construction of new accommodations in the Yosemite Village area. Hamilton Stores, Inc., has agreed to spend some $600,000 in improving its public facilities in Yellowstone National Park; the Mesa Verde Co. agreed to provide additional housing for visitors at Mesa Verde Nation Park; and Almours Securities, Inc., will improve facilities on the George Washington Memorial Parkway at Mount Vernon.

At Lake Mead National Recreation Area, concessioner improvements made during the year include the Anderson Brothers' 150-unit trailer court at Boulder Beach; 6 new cabins, a shop and other facilities at Temple Bar; a 60-unit trailer court and 8-room motel by Mohave Resorts Co. at Katherine; and an 8-room employees' dormitory at Lake Mead Lodge. The long-standing boat transportation problem of the Statue of Liberty National Monument has been resolved with the awarding of a concessioner contract to the Circle Line-Statue Ferry, Inc., which has placed two new boats in operation. In Hawaii National Park, the concessioner completed an addition to Volcano House; an inn and cabins were completed on Ocean Strip, Olympic National Park; and bungalow units and service station at Lassen Volcanic National Park.

While these improvements are welcome, it must be pointed out that they meet only a small fraction of the need for improvements and additions to care for the great increase in number of visitors.

USE OF COMMERCIAL UTILITY SERVICES

Substantial progress was made in the program of utilizing commercial facilties in park areas as substitutes for locally-operated utilities. Improved service and reduced costs have resulted, particularly in the electric power and communications fields.

At Grand Canyon National Park, where the Arizona Public Service Co. contracted to supply electricity, service will be improved and annual savings of $20,000 have been estimated. Western Engineering Co. has contracted to take over maintenance of all radio communications in Glacier National Park at an estimated saving of $8,000 a year. Here also, contracts have been negotiated with the Flathead Electric Corp. and the Glacier County Electric Cooperatives to furnish electric service to various areas. At Big Bend National Park, the Rio Grande Electric Cooperative, Inc., with an allotment of REA funds, brought in electric power to the principal developed areas, resulting in elimination of 10 power-generating units in the park.

Electrical service by the Salt River water users power district at Tonto National Monument, introduced during the year, has eliminated use of small electric powerplants, reduced expense and improved service. Arches National Monument has contracted with the Utah Power & Light Co., for electric power and the use of propane gas will be eliminated. Use of Arizona Public Service gas at Southwestern National Monuments headquarters eliminated propane gas and reduced costs one-third in the first 7 months.

In Grand Teton National Park, a contract for construction of a powerline from the south boundary of the park to Jackson Lake Lodge and Colter Bay, together with spur lines serving other developed park areas, was awarded by the REA to Alpha Construction Co. on May 28. The project was expected to be completed well in advance of the 1955 travel season.

The Mountain States Telephone & Telegraph Co. has taken over maintenance of the Mesa Verde National Park telephone system under contract. Negotiations were under way with the Pacific Telephone and Telegraph Co. to operate the telephone system in Sequoia and Kings Canyon National Parks and in Mount Rainier National Park. Other national parks including Zion, Bryce Canyon, Shenandoah, Mammoth Cave, and Great Smoky Mountains were in the negotiating stage for commercial telephone services. At Shiloh National Military Park, arrangements had been completed for installation of dial telephone service by the Adamsville Telephone Co.

CONSTRUCTION PROGRESS

The outstanding development of the year pertinent to vitally needed construction projects was the contract authorization provision in the 1954 Federal Aid Highway Act signed by the President on May 6. Under this provision whereby funds authorized for park roads and trails and for parkways in the next 3 years are immediately available for contract, a total of $35,000,000 is authorized for park road and trail construction and $32,000,000 for parkways.

The average annual appropriation for roads and trails in the 8 postwar years has been only about $4,000,000 in each of the 2 categories. Through the new provision, work will be almost tripled. Also it will be possible to speed up progress on the huge backlog of work, completion of which is of vital importance for the preservation of park areas and the safety of the millions of park users.

To enable the Service to implement an accelerated program in the 1955 fiscal year under the contract authorization provision, Secretary McKay requested congressional approval on June 11 of a $5,275,000 supplemental appropriation. Of this amount, $4,075,000 would be added to the 1955 budget estimate of $425,000 for parkways; and $1,200,000 to the $3,800,000 estimate for roads and trails. A major portion of these funds will be required to meet payments for contracts awarded to private contracting firms under competitive bidding.

In the 1954 fiscal year, the $10,376,300 in new construction funds appropriated included $4,050,000 for buildings and utilities; $4,010,000 for roads and trails; and $2,316,000 for parkways. In addition, $1,500,000 was appropriated to finance a 1952 Federal Highway Aid Act contract authorization for the Baltimore-Washington Parkway.

With the new funds and other obligated moneys from previous appropriations, the Service directed construction primarily toward provision of the most urgent public use facilities. Such work, including roads, trails, parking centers, campgrounds, buildings, passenger elevators, utility systems and related facilities necessary for administration, protection and interpretation, was accomplished to an appreciable extent. Parkway construction progressed on a limited scale on 6 of the 8 authorized parkways.

Buildings, utilities, and grounds.—An expansion of facilities at Grand Teton National Park was undertaken and contracts awarded for: a water supply system to the Jackson Lake Lodge and Colter Bay areas, $331,021.10; and an electric distribution system for the Jackson Lake area, $37,500. In Everglades National Park, work was begun on the first major public use development at Flamingo, on Florida Bay. Dredging was started there on a boat basin and other developments will include camping and picnic facilities, dock and shelter building, roads, and water and sewer systems.

At Carlsbad Caverns National Park, a $208,619 contract has been awarded for two 25-passenger elevators and construction of the elevator house. Excavation of the elevator shaft and construction of a pit and lobby in the cavern were completed by the contractor at a cost of $231,718.50. A project to improve electricity in the caverns is in progress. At three different locations in the cave a total of 2,500 seats have been installed to provide visitor comfort during interpretive talks.

Of special note was the construction of an addition to the Chickamauga museum to house the Fuller collection of small arms, administration and public-use buildings at Joshua Tree and Saguaro

National Monuments, and utility buildings in Potomac Park, Washington, D. C., and at Death Valley National Monument. New campgrounds were developed in several areas including the first 2 at Mount McKinley National Park, Alaska, and the first 1 at Organ Pipe Cactus National Monument. At Coulee Dam National Recreation Area, 16 small campgrounds and picnic areas were developed by the rangers in their spare time with the help of donated labor from adjoining towns.

During the year, the Atchison, Topeka, and Santa Fe Railway Co. donated to the Federal Government the utility facilities it owned in Grand Canyon National Park, appraised at $1,100,000. On March 11, 1954, the director accepted title to these facilities for the Government.

Parkway development.—With 1954 appropriations and carryover funds from previous years, parkway construction contracts and force account projects totaling $9,534,834.90 were completed. These included 29.7 miles of grading, 10 bridges and grade separation structures, and 16.4 miles of paving. All major construction contracts under the $14,500,000 authorized for the Baltimore-Washington Parkway, the high-priority defense project, were either completed or nearing completion by the end of the fiscal year. The parkway portion between Jessup Road, which joins the State of Maryland section, and the Laurel-Bowie Road, a distance of 7 miles, was opened to traffic in November 1953. Balance of the project was expected to be completed and open to traffic in October 1954.

Work continued on grading of the 4-mile gap in the Blue Ridge Parkway on sections 2U and 2V west of Asheville, N. C., to connect 2 previously graded units, and on the Tuggles Gap separation structure in Virginia. Bids were opened on June 29 for the contract to grade section 2G1, 3 miles, in the vicinity of Blowing Rock, N. C. When completed this section will provide direct access to the Moses H. Cone Memorial Park on the parkway and will enable motorists to bypass the congested resort town of Blowing Rock.

An aerial mapping survey of the Cumberland-to-Hancock section of the Chesapeake and Ohio Canal Parkway was started and, when completed, will provide topographic maps of the first unit of approximately 15 miles from Cumberland, Md., to Oldtown. Completion of the grading, stone base, and paving of 1.6 miles of the Foothills Parkway between Gatlinburg, Tenn., and Banner Bridge, has eliminated the need to use the dangerous one-way Banner Bridge across the west fork of the Little Pigeon River.

Plans were completed for the hydraulic fills on the section of Colonial Parkway between Williamsburg and Jamestown Island, Va., and this work was expected to start early in fiscal 1955. Concentrated efforts continued toward completion of the Jamestown-Williamsburg-Yorktown portion of the highway in time for the 1957 celebration of the 350th anniversary of the founding of Jamestown.

On the Natchez Trace Parkway, 2.4 miles of grading and one overpass structure in the vicinity of Tupelo, Miss., were completed. Approximately one-third of the grading on an adjoining section was completed by day labor before closing down the project due to lack of funds. The grade separation underpassing Mississippi State Highway No. 35 near Kosciusko, Miss., was also completed and opened to traffic. Grading of a 34-mile unit between Alabama Highway No. 2 and U. S. Highway No. 64 in Tennessee was completed and paving was started under contract. When finished, this will be the first major unit of the parkway to be completed in those States. The 64-mile completed section in Mississippi had close to 1.5 million visitors recorded in 1953.

Bureau of Public Roads construction.—Though the park roads program undertaken by the Bureau had fewer completions than previous years, the scope of the program was significant. Several outstanding road replacements and improvement projects that had accumulated over a period of years due to limited funds were started. The work of this nature under contract as of June 30, 1954, represents $2,327,000 and applies to 44 miles of road. The total road program under contract amounted to $4,552,224 affecting 100 miles of road.

The newly initiated projects included work on the Many Glacier and Approach Road to Glacier National Park, and resurfacing of the Going-to-the-Sun Highway; reconstruction of 3.5 miles of the Norris Canyon Cutoff Road, Yellowstone National Park; replacement of a portion of the Cedar Pass-Pinnacles Highway, Badlands National Monument; replacement of a 6.5-mile portion of the Bear Lake Road, Rocky Mountain National Park; reconstruction of the last section of the South Entrance Road, Grand Canyon National Park, supplementing work started in 1953; and a 9-mile portion of the South Approach Road to Grand Canyon National Park.

Projects completed totaled 10 miles at a cost of $520,000 including the Katherine Spur Road, Lake Mead National Recreation Area; a 1.5 mile section of the Heart of the Hills Road, Olympic National Park; 2 surfacing projects on the Cades Cove Road, Great Smoky Mountains National Park, and 1.8 miles at the eastern terminus of the Zion-Bryce Canyon Approach Road.

Park Service roads and trails program.—Outstanding roads and trails projects completed under direct Service supervision include the new campground at the Old Faithful area in Yellowstone National Park; slope stabilization on roads in Shenandoah National Park, and along the Rim Road in Crater Lake National Park; the concrete sidewalks and utility yard at the Statute of Liberty National Monument;

the utilities road at Badlands National Monument; the road system for the Colter Bay development at Grand Teton National Park; the bypass road at Appomattox Court House National Historical Park; and the West Entrance Road at Big Bend National Park.

SPECIAL STUDIES

Sanitation studies.—To develop economic and efficient refuse and trash disposal methods, to meet the load imposed by vastly increased visitation, negotiations have been completed with the United States Public Health Service to conduct a series of trash and refuse disposal studies during fiscal 1955 in Glacier, Yellowstone, Grand Teton, Yosemite, Shenandoah, and Great Smoky Mountains National Parks.

Trailer accommodation study.—The special study, initiated last year, to determine how best to meet the growing demand for modern trailer accommodations in national parks, has been completed. A handbook containing results of the study is being prepared for distribution to administrative and professional personnel.

NATURAL HISTORY

Interpretive activities.—The need for more personnel in the parks, not only the protective forces but those in the naturalist field to interpret the scenic-scientific areas to the people becomes increasingly acute. As visitors continue to increase, supplementary devices—visual and self-guidance aids—are being employed effectively. Interpretive facilities and services in the 58 scenic-scientific areas served 18,901,244 people in 1953, compared with 17,143,947 for 53 areas in 1952, an increase of 10.2 percent. Emphasis on self-guidance was reflected in an increase from 9,424,984 persons served in 1952 to 11,207,740 in 1953.

Pilot studies of visitor needs and interpretive methods have been undertaken jointly by naturalist and historian staffs. Visitor interviews and a field study were conducted in May 1954 at Fort McHenry and a similar study was scheduled for early August at Acadia National Park. Other studies included one on self-guiding trails and tours, another on performance-testing of audiovisual equipment together with experimental installations in selected areas. Interpretive signs and markers were under study and improvements were being introduced. A survey of campfire circles was completed and the resultant report will serve as a guide for a servicewide campfire rehabilitation program. Plans were under way for a study aimed at bettering opportunities for visitors to observe wildlife in the parks.

Progress in interpretive training.—Significant progress was made in training interpretive personnel. A 5-day Visitor Service Conference in October 1953 at Shenandoah National Park conducted on a servicewide basis produced plans for improved training methods and aids. Key interpretive personnel of Region 3 attended a 4-day training course at Grand Canyon National Park in March 1954 and spent an additional day of joint training with protective personnel. In Yosemite National Park, personnel from the Pacific coast areas and the California State Parks division worked out procedures for effective area-level training at a 5-day area-level course.

Two in-service training booklets, Talks, and Conducted Trips, were published during the year and 2 other publications were nearing completion. Volume 25 of the Administrative Manual, Information and Interpretation in the Field, was revised in a streamlined edition for easier use.

Accelerated research.—Plans were developed for a comprehensive 2-year cooperative geological research program at Cape Hatteras National Seashore. Field work will start in the late summer of 1954 to continue through the 1956 field season. The Institute of Coastal Studies of the University of Louisiana and the Geological Survey are cooperating in this project. The survey was made possible through a private donation of $25,000 to the Service for the purpose.

A geological, biological and archeological study of Katmai National Monument in Alaska, initiated in June 1953, was continuing into the 1955 fiscal year. Cooperators in this project included the Office of Naval Research, the Arctic Institute of North America, the United States Public Health Service, and the Geological Survey with logistic support from the Army and Air Force. When the second and somewhat limited phase began in June 1954, participants included the Geological Survey, Public Health Service, the Department of Agriculture and the University of Alaska with the Army and Air Force again providing logistic support.

The Geological Survey made important contributions to geological research in other Service areas including geologic mapping in Great Smoky Mountains National Park, Carlsbad Caverns National Park and Mesa Verde National Park. After these were completed, a study of the geology of Jackson Hole in Grand Teton National Park was initiated, and negotiations were under way for a general geological study of Yellowstone National Park.

Wildlife studies.—Biological studies were undertaken in Katmai on the caribou and Dall sheep range and population problems; on sheep-wolf relationships in Mount McKinley National Park; and elk herds of Northern Yellowstone, Jackson Hole, Rocky Mountain, and Olympic. At Yellowstone, 207 antelope were trapped for live shipment; 139

bison were destroyed, with carcasses distributed to Indian tribes; and approximately 1,050 elk were removed, falling far short of the desired reduction of 5,600. Reduction of the Jackson Hole elk herd by licensed hunters produced a kill of only 109 elk inside Grand Teton National Park.

Cooperating societies.—Three new natural history associations were authorized, at Lake Mead, Great Smoky Mountains, and Death Valley. There are now 21 cooperating societies in scenic-scientific areas.

Publications sales by the associations increased to approximately $175,000 from approximately $135,000 last year. There were 12 new titles published, and 51 additional titles revised or rerun. Equipment, materials, and services valued at almost $25,000 were contributed to the Service.

HISTORY AND ARCHEOLOGY

Visitors to the 122 historical and archeological areas of the National Park System totaled 18,325,161 during the calendar year 1953. Nearly 11,000,000 of these received guidance and help from Service personnel in the 80 areas where such contacts are recorded.

Audiovisual aids.—To supplement personal interpretive services, the year saw increasing use of audiovisual aids of various kinds. The most outstanding automatic synchronized tape-and-slide presentation installed during the year was Shiloh—Portrait of a Battle, a 17-minute account of the Battle of Shiloh, with musical background, offered at Shiloh National Military Park. A 20-minute recorded talk at the Gettysburg Cyclorama; a tape recorded talk given on the Statue of Liberty boat; and a tape recording with filmstrip, prepared by the staff of Independence National Historical Park in cooperation with the University of Pennsylvania Graduate School of Education, were some of the other interesting accomplishments in this important field.

Self-guiding trails.—A self-guiding tour route, supplemented by a self-guidance leaflet, was placed in use for the Independence Hall group of buildings at Independence National Historical Park, its use directed primarily to school groups. Use of the technique of self-guidance was extended to the main ruins at Bandelier, Tumacacori, and Navajo National Monuments, and at the Pioneer Farmstead area of Great Smoky Mountains National Park.

Donations.—In addition to the General Federation of Women's Clubs donation of more than $209,000, and the gift of the Claud E. Fuller arms collection, mentioned earlier, the Service obtained also fine examples of 16th century arms and armor through two generous donations. Funds given by Representative Charles E. Bennett of Florida were used to purchase some excellent pieces of the type illustrated in 1,564 drawings of Fort Caroline by Le Moyne; and two very fine suits of armor were donated by Mr. C. O. V. Keinbusch of New York for use in the armory planned at San Juan National Historic Site. Two Fort Sumter flags, hauled down when the fort was evacuated in 1861 and raised there again when it was reoccupied in 1865, given by the Department of the Army, are to be placed at the fort; the flag which draped Lincoln's casket, also presented by the Army, will be displayed at the Lincoln Museum.

Restoration, stabilization, and rehabilitation.—The most outstanding restoration of the year was at Fort Necessity, scene of Washington's first battle. There, archeological investigation had disclosed remains of the original stockade posts still in place. This discovery settled a century-old controversy as to the original shape of the fort.

The historic stables at Hampton National Historic Site are being rehabilitated with donated funds. One is to be a period stable; the other will display period carriages and exhibits relating to the early life at Hampton. To this end, a fine early 19th century carriage is being restored, also with donated funds.

Assistance in safeguarding our historic heritage.—The public interest in historical conservation work continued to mount. During the year, requests for the preservation of places of historical importance were received from 119 individuals and organizations, and involved 69 different areas. Of this large total, 6 proposals were handled on behalf of the President; 50 involving 30 historic areas on behalf of Members of Congress; and 47 requests involving 33 areas were studied and considered on behalf of individuals or patriotic organizations. To the already large number of bills introduced into the Congress to promote the preservation of historic places or to establish memorials, 107 new bills were introduced relating to 25 areas or historical subjects. In addition, six bills were introduced relating to matters that pertained to established areas in the National Park System.

Jamestown-Williamsburg-Yorktown Celebration Commission established.—Senate Joint Resolution No. 62, approved by the President on August 13, 1953, provided for the establishment of the Jamestown-Williamsburg-Yorktown Celebration Commission to be composed of 11 members. This Commission will develop plans for the celebration, in 1957, of the 350th anniversary of the founding of the first permanent English settlement in America at Jamestown in 1607, the flowering of Colonial Virginia culture and statesmanship at Williamsburg on the eve of and during the Revolution, and the final winning of American independence at Yorktown on October 19, 1781. Toward this end, the Federal Commission, the establishment of which was completed on April 10, will cooperate with and assist the Virginia 350th Anniversary Commission established by the State of Virginia.

Historic preservation in time of armed conflict.—As great cultural treasures are peculiarly vulnerable in time of war under modern conditions of warfare, the Service joined with the Department of Defense, the National Archives, Library of Congress, Smithsonian Institution, and National Gallery of Art in assisting the Department of State in the preparation of the position to be taken by the Government of the United States on a proposed International Convention for the Protection of Cultural Property in the Event of Armed Conflict, the subject of an international conference at The Hague, Netherlands, April 21 to May 14, 1954. A United States Delegation was sent to The Hague Conference and it was found possible to sign the Convention on behalf of the United States. Fifty-four nations were represented at the conference. Thirty-six nations, including Russia, signed the convention.

The treaty, to be ratified by the United States Senate before it becomes law in this country, should give an additional measure of protection to historic sites, buildings, and museum objects in time of armed conflict as compared with the older rules of international warfare based on The Hague Agreements of 1899 and 1907.

Archeological field studies.—Outstanding discoveries in the field of archeology were made in the areas of the National Park System. At Death Valley National Monument, surveys and test excavations by the University of Southern California have uncovered a range of sites dating from beach occupation of Pleistocene Lake Manly to recent sites with historic contact material. At Aztec Ruins National Monument, excavation of the Hubbard Mound disclosed an unusual round building about 60 feet in diameter which consisted of a kiva—or ceremonial chamber—surrounded by two concentric rings of rooms. Evidence of earlier structures was found underneath the circular building.

SALVAGE OPERATIONS

River basin archeology.—The Service continued to cooperate in the Interagency Archeological Salvage program in conjunction with the Smithsonian Institution and other Federal and State agencies, including universities. At Garrison Reservoir, N. Dak., rising waters in the spring of 1954 so threatened the old site of Fort Berthold that the Corps of Engineers made every effort to divert the rising waters in order to allow the archeologists as much time as possible to salvage these remains. Under contract with the Park Service, the North Dakota State Historical Society and the Smithsonian Institution each put parties in the field at the earliest possible date. The archeologists uncovered the remains of the earliest fort at this site, as well as later structures. Photographs and maps will help supplement the artifacts uncovered and give a permanent record of this important military post long after its location has disappeared under water.

At Fort Randall Reservoir, two field parties of Smithsonian scientists frantically gathered material and test excavated ancient Indian sites—often with the rising waters lapping around their feet. A cooperating institution, the University of Kansas, also excavated several sites in the Fort Randall area. In the Oahe Reservoir, the University of South Dakota carried on archeological salvage operations, uncovering material which helps to tell the story of the early Mandan and Arikara Tribes along the Missouri River.

In the Buford Reservoir, Georgia, one site yielded material which could be dated by the new radio-carbon method developed by Dr. Libby at the University of Chicago. This material indicated that the area had been inhabited by early Indians some time during the period 300 B. C. to the year A. D. 1.

In the Table Rock Reservoir area of Missouri, the University of Missouri continued its archeological salvage operations. It is this area which possibly contains the last unspoiled remains of the Ozark Bluffdwellers. Because of the excellent preservation afforded by the dry caves, many perishable artifacts of wood, fabric, and basketry have been recovered.

MUSEUM ACTIVITIES

Several new museums were opened and many additional exhibit units were completed in the course of the year. The Service's museum laboratory installed a series of new exhibits for the small museums at Appomattox Court House National Historical Park, Mammoth Cave National Park, and Cape Hatteras National Seashore. At Fort Necessity National Battlefield Site, new exhibits were placed in the reconstructed storehouse and stockade, in time for the 200th anniversary celebration on July 3 and 4, 1954. The fine new museum wing at Chickamauga and Chattanooga National Military Park headquarters was completed. New or revised exhibit panels or displays were prepared and installed in the existing museums at Jamestown, Kings Mountain, Antietam, Vicksburg, Fredericksburg, Fort Raleigh, Whitman, Castillo de San Marcos, Natches Trace, Homestead, and George Washington Carver; and museum laboratory technicians were working on museums at Jefferson National Expansion Memorial and at San Juan National Historic Site.

Electric orientation maps.—Two such maps were completed and installed at Fredericksburg and Shiloh National Military Parks, and another was planned for Fort McHenry National Monument. General improvements of museum exhibits were completed at a number of other areas. In connection with the 50th anniversary of man's first flight, in December 1953, the Service opened to the public the reconstructed and refurnished hangar and quarters used in 1903 by the Wright Brothers in their experiments at Kill Devils Hills, N. C.

New branch laboratory.—A new specialized branch preservation laboratory was placed in operation at Gila Pueblo, headquarters of Southwestern National Monuments. Its function is to clean, repair, number, file and catalog pottery specimens of scientific interest from Southwestern park and monument collections.

The Museum Branch designed, constructed and installed exhibits in the new State park museum at Marksville, La., by request of the State. Nine duplicate dioramas of airborne support for a beach assault were completed for the Marine Corps.

PUBLICATIONS

Despite the great increase in number of visitors to the areas administered by the National Park Service, the amount available for the printing of informational publications has remained at $96,500 a year for the past 4 years. The result has been to limit the quantities available for distribution to park visitors as well as to curtail the introduction of new items of sales literature.

Of the so-called free literature, 8,045,000 pieces were ordered during the year, involving the issuance of 98 requisitions. Requisitions were also issued for three new items in the slowly growing historical handbook series—Fort Necessity, Fort Laramie, and Vicksburg; for natural history handbooks for Rocky Mountain National Park and Badlands National Monument; and for Transplanting Trees and Other Woody Plants, a slightly revised item in the tree preservation series which will have a much improved format.

The enthusiastic reception accorded the Olympic National History Handbook, first item in this new series, required a second printing only 3 months after its appearance.

Eastern and Western United States maps, each showing the areas administered by the Service and with essential information about each area on the reverse side, were sent to the printers. These will be used mainly to answer inquiries, and will greatly simplify the process in the Washington office.

The handling of inquiries.—Through the adoption of a thoroughly streamlined processing procedure near the end of the fiscal year 1953, handling of the flood of inquiries and requests for publications has been kept reasonably current for the first time in many years.

Cooperating society publications.—Because of the Service's limited printing funds, officially designated cooperating societies and associations have come to play an increasingly important part in the production of needed publications since the war; in that way, they have performed an invaluable service. In connection with our effort to raise the quality of these publications and those issued by the Service, we have been fortunate in obtaining the advisory services of Mr. Sidney Jacobs, in charge of production for Alfred A. Knopf, Inc.

PROTECTING THE PARK FORESTS

Through vigilant fire-control operations and improved protection of the park forests, the Service's fire-prevention record was a creditable one in the past year. The intensive and consistent training courses for forestry personnel again proved worthwhile in preventing tremendous fire losses in several park areas. Hazardous fire weather conditions generally followed the pattern of the 1952 calendar year with critical periods in the East exceeding those of the previous two decades.

Significantly, more lightning fires were reported than during any previous year on record. Although the number of 487 fires and 14,833 acres burned in Service-administered areas exceeded those of last year, the total burned area was less than the preceding 10-year average. Severe lightning storms caused 28 fires in Yellowstone National Park and 31 in Yosemite National Park, and imposed heavy additional responsibilities on park personnel during periods of heavy visitor use. With the contributory help of neighboring protection agencies and experienced Indian fire crews flown in from Southwestern Indian reservations, the situations were all well handled.

Tree disease control.—White pine blister rust continued, as last year, to be the tree disease of major concern in park areas. The control program under way in 13 areas was nearing completion, with 78 percent of the control area requiring only infrequent examination. The control of dwarfmistletoe in the ponderosa pine forests of Bryce Canyon National Park, the second project of this kind undertaken in a national park, was successfully completed. Oak wilt, a deadly disease threatening the hardwood forest cover of the East, was found in a small area of Shenandoah National Park and control work was undertaken immediately. Control work continued on a similar infection in Effigy Mounds National Monument.

Forest insects.—The epidemic upsurge of several forest insects required expanding control programs throughout the country. Damaging infestations developed within several national park areas, requiring the close attention of park foresters. With the help of cooperating entomologists in appraising the situations, control programs were introduced in 5 of the 8 areas where significant epidemics occurred or threatened. Included were control of lodgepole pine needle miner and mountain pine beetle in lodgepole pine, Yosemite National Park; Jeffrey pine beetle in Jeffrey pine, Lassen Volcanic National Park; Black Hills beetle in ponderosa pine, Bryce Canyon National Park; and southern pine beetle in pitch pine, Great Smoky Mountains National Park. Of special interest was the successful airdrop of supplies and equipment to a newly established mountain pine beetle-control camp at an elevation of 10,000 feet in Yosemite National Park. In other areas, maintenance control of insect attacks continued on 16 projects and were successful in keeping tree losses at a minimum.

Grazing.—Despite increasing pressures to open new areas for livestock grazing, reduction of grazing within the scenic and scientific park areas has been relatively successful in the past decade. The practice has been eliminated in 11 western areas that reported grazing in 1943. There has been an overall decrease of 43 percent within all western areas, and a reduction of 36 percent in servicewide grazing during that period.

CHANGES IN THE NATIONAL PARK SYSTEM

Fort Vancouver National Monument established.—Secretary McKay signed an order on June 30 which finally established Fort Vancouver National Monument in Washington, authorized by Congress in 1948. The order was to become effective on publication in the Federal Register on July 9. Some 60 acres of federally owned lands were transferred to the Department through the General Services Administration for the monument site. Fort Vancouver played a significant role in the settlement and development of the Pacific Northwest. From 1825 to 1846, it was western headquarters for the Hudson's Bay Co., and the center of economic, political, social and cultural life in the Oregon country. In 1849, it became the first United States military reservation in the area. The monument site adjoins Vancouver Barracks, an active Army post.

Contemplated additions.—Legislation enacted by the 83d Congress authorizing establishment of Fort Union National Memorial in New Mexico was on the President's desk awaiting his signature at the end of the fiscal year. The old fort, founded in 1851 as a protector for travelers over the Sante Fe Trail and against plundering Indians, played an important part in establishing United States control in the Southwest. Its impressive ruins are still standing. A bill to authorize the City of Refuge, Territory of Hawaii, which passed the House of Representatives in the 2d session of the 83d Congress, was still in the Senate committee at the end of the fiscal year.

LANDS AND AREA PROJECTS

Land acquisition.—Notable progress was made in the Service's long-range program of acquiring non-Federal lands within approved park boundaries. Some 92,750 acres were brought into the National Park System by purchase, exchange or donation or were about to be acquired at the end of the fiscal year.

By a secretarial order of March 12, Everglades National Park boundaries were extended by approximately 271,000 acres, which are within the maximum boundaries authorized by the act of May 30, 1934, The extension, a major part of that required to complete the park, includes some 30,000 acres with mineral rights purchased by the United States in 1951 with $97,000 donated by the State of Florida; 60,000 acres of Florida-owned land, expected to be transferred soon to the Federal Government; 10,000 acres donated to Florida by the Collier Corp., and now in trust awaiting transfer to the United States; and 171,000 acres of privately owned land. Part of the famed Ten Thousand Islands area lies within the extension. About $300,000 of the $2,000,000 donated by the State of Florida for land acquisition remains for purchases in the extension. During the year, two adjoining properties of about 18 acres on Key Largo, including a residence and dock, were acquired and are being used as a ranger station for the Florida Bay district of the park. In acquiring lands as the basis for Everglades Park it has taken some years to settle complicated court cases and to wind up negotiations and settlement. This has been done within the fund donated for the purpose by Florida, and with but one single appeal beyond the original court of jurisdiction.

Important steps were taken toward the fulfillment of the Cape Hatteras National Seashore Recreational Area project. About 2,600 acres of land was purchased with $180,000 of the $1,236,000 donated in 1952, half by the Avalon and Old Dominion Corps., and half by the State of North Carolina, for establishment of the area. These lands are on Hatteras and Bodie Islands and include the so-called Gooseville Gun Club property, a favorate haunt of migratory waterfowl. Additional tracts on the two islands, totaling 3,000 acres, are being acquired by State condemnation. Also, the Service has options involving some 500 more acres to cost $40,000. By the end of the fiscal year, 23,000 of the 28,500 acres scheduled for inclusion in the project had been acquired or were under option for acquisition.

The early establishment of Cumberland Gap Historical Park as a unit of the National Park System was anticipated; only the closing of certain streets in Middleboro, Ky., was holding it up. The States of Kentucky, Tennessee, and Virginia have acquired some 20,000 acres of land at a cost of about $1,500,000 in the past 10 years, to be deeded to the Federal Government for the project.

Negotiations for the majority of tracts needed for Independence National Historical Park were well underway to settlement. Virtually all of the properties within the project are expected to be acquired by 1955, with the exception of the Irvin Building, which is not at present proposed for acquisition. Obligations to date on completed purchases, contracts to purchase, and for condemnation awards total approximately $5,650,000 of the $7,700,000 appropriated for acquisition of properties necessary to establish the area.

The State of Maryland was still in the process of acquiring some 800 acres, chiefly of mountainous terrain, as its portion of the Harpers Ferry National Monument project. The State had previously appropriated $40,000 for the purpose. In 1953, the State of West Virginia transferred some 500 acres of land and scenic easements to the Federal Government, including a portion of the old historic section of the town of Harpers Ferry.

Exchanges, donations, and purchases.—A highlight of the year was the virtual completion of exchanges to secure Federal ownership of lands heretofore held by the State of Montana in Glacier National Park. Involved is the exchange of about 200,000 acres of public domain grazing land in eastern Montana for about 9,350 acres of timber land in the park. The value of each is approximately $800,000. On the same equal-value exchange basis, the Service acquired a total of about 1,200 acres in Glacier, Lassen Volcanic, and Olympic National Parks, Gettysburg and Petersburg National Military Parks, Theodore Roosevelt National Memorial Park, and Joshua Tree National Monument. Pending exchanges involve several thousand acres in the Theodore Roosevelt and Joshua Tree areas, and the Service proposes to exchange some 6,700 acres of excess federally owned lands in Queets Corridor and Ocean Strip, adjacent to Olympic National Park, for privately owned lands in western national parks.

Donations included 430 acres of land for Acadia National Park by John D. Rockefeller, Jr.; 60 acres for the Home of Franklin D. Roosevelt Historic Site by the Franklin D. Roosevelt estate; 2 acres for Antietam National Battlefield Site by the Washington County, Md., Historical Society, and 2.12 acres for Hampton Historic Site, purchased with funds donated by the Avalon Foundation. Other lands acquired by donation include: 270 acres for Grand Teton National Park from the Jackson Hole Preserve, Inc.; 37 acres for Manassas National Battlefield Park from the State of New York; a half-acre parcel of land for Fredericksburg and Spotsylvania County National Military Park from the Confederate Memorial Literary Society; and 995 acres in fee and 318 acres of scenic easements for Natchez Trace Parkway from the State of Mississippi.

In addition to the above acquisitions, the Service purchased or contracted to purchase approximately 2,100 acres of important privately owned properties in Glacier, Great Smoky Mountains, Kings Canyon, Lassen Volcanic, Rocky Mountain, Yosemite, and Zion National Parks, in Gettysburg National Military Park, and in Colorado, Glacier Bay, and Sitka National Monuments. About $300,000 is involved in these purchases.

Special and defense uses of park lands.—At the end of the year, approximately 1,600 special-use permits and 50 national-defense-use permits were in force in areas of the National Park System. The special-use permits covered mainly small parcels of land being farmed to maintain historical and rural scenes, or are for access facilities from private lands to park roads, and for utility lines. Of the defense-use permits, the majority were for short-term training purposes.

The Atomic Energy Commission continued its reconnaissance surveys for strategic minerals in park areas. It completed a report on Fossil Cycad National Monument disclosing possible commercial ore bodies within the monument boundaries, and recommended a more thorough investigation for a proper evaluation of potentialities in the area.

SOLVING WATER PROBLEMS

Water resources and rights.—In full compliance with individual State laws, progress continued in the complicated but important acquisition of essential water rights in park areas. These are necessary for adequate servicing and protection of the areas and their millions of visitors. Since 1936, the Service has established 380 rights to the use of water in 47 national parks, monuments and recreational areas in the 13 Western States. About half are covered by decree or water laws; the remainder are in permit form. At the end of the year, there were 42 water right applications to file as a result of amended State water laws, or because of the probable construction of new water systems within the next few years.

During the year, the Service inventoried the 156 Federal and 44 private water rights in Grand Teton National Park and was progressing with the work of defining Federal and private responsibilities for maintenance and operation of the water systems. In Death Valley National Monument, Federal acquisition of three tracts of land and appurtenant water interests to eliminate conflicts with Federal water interests was nearing completion. Steps were initiated to prevent further conflicts with Federal water interests at Organ Pipe Cactus National Monument by those authorized to use the area for grazing purposes.

The Service continued cooperation with the Geological Survey, New Mexico State agencies, and the Carlsbad Irrigation District on important water resource matters. One was on measures to control the ground waters of the Black River extension of the critical Carlsbad ground water basin; another, to protect Federal rights to the use of Rattlesnake Springs water for Carlsbad Caverns National Park. Cooperation was also continuing with the town of Tropic, Utah, in an attempt to find a more adequate water supply for the town without encroachment on Bryce Canyon National Park.

LAND AND PROPERTY DISPOSAL

Transfers of land and property to other agencies.—Increased emphasis was placed on the elimination of areas and area-units considered lacking in true national significance and that attract primarily local visitation or use. Some 4,660 acres were thus transferred to State and local bodies for inclusion in their park systems.

In May 1954, the President approved legislation abolishing Shoshone Caverns National Monument and authorizing transfer of the approximately 213 acres of land to the city of Cody, Wyo., for park purposes. Also, title to an 0.41-acre parcel of land in Morristown National Historical Park was conveyed to the city of Morristown for its use.

Approximately 4,447 acres of the Catoctin Recreation Demonstration Area was transferred to the State of Maryland for its park system. In formal ceremonies on June 11, the director of the National Park Service presented the title to this property to Gov. Theodore R. McKeldin. The name "Catoctin Mountain Park" has been approved for the approximately 5,747 acres remaining in Federal ownership. Camp David, the mountain retreat of the President of the United States, and the two long-term camping establishments remain in the sector of the park still being managed by the office of National Capital Parks.

Legislation authorizing the abolishment of Old Kasaan National Monument and transfer of the lands to the Forest Service was pending at the end of the year. Other proposals to abolish 6 national monuments and 1 national battlefield site and to transfer the lands to the respective States or to dispose of as surplus property were under discussion with the various congressional delegations and the States.

Real property disposal.—The Service continued its cooperation with the General Services Administration and other agencies in connection with the disposal of surplus Federal real-property under provisions of the Surplus Property Act of 1944, as amended. Eight applications for the acquisition of such lands by State and municipal agencies for public park, recreation, and historic monument use were processed. These totaled approximately 325 acres and 4 buildings, and have returned about $27,537 to the United States Treasury.

After lengthy negotiations, the 35-acre Hospital Cove area on Angel Island in San Francisco Bay, including a boat harbor and some 30 buildings, was transferred to the State for use as a historic monument. Gov. Goodwin J. Knight accepted the deed on March 11, 1954. The California State Park Commission has filed an application for an adjoining 140 acres for similar purposes upon termination of use by the Department of the Army.

As required in connection with surplus real property sales, deeds conveying title usually contain a provision that the recipient body will use the area for the purpose indicated over a certain period of years and report biennially on area management. As a result of a recommendation by the Secretary's management survey team, responsibility for enforcing such provisions was delegated to the Service by secretarial order of March 30. Previously, the Bureau of Land Management was the responsible agency.

COOPERATIVE ACTIVITIES

The Service continued its program of river basin studies with new emphasis on basinwide surveys. An important step was the completion of the Report on the Recreation Resources of the Rogue River Basin, Oreg., requested by the Secretary of the Interior in 1950. In addition, important and satisfying progress was made on the Arkansas-White-Red River Basin, and New York-New England region projects, and the Missouri River basinwide study. In the last of these, inventories of existing and potential recreation areas were virtually completed. The pilot Research Report on Recreation Habits, Needs, and Desires of the People of the Niobrara River Basin, Nebr., was prepared by Iowa State College.

Work in the Columbia River Basin was limited to cooperation with the Bureau of Reclamation and other agencies, and the group camping survey of the project area conducted by Washington State College. The recreation survey of the Gunnison River drainage in Colorado continued with inventory work on national forests and Colorado Game and Fish Commission lands.

Recreation planning of areas.—Recreation planning of reservoir areas continued to be an important form of cooperation with the Bureau of Reclamation and the Corps of Engineers. In addition, three reservoir management agreements were executed; the Service played an important part in the consummation of these. Four reservoir areas in Wyoming are being administered by the State under temporary licenses granted by Reclamation during the year. In addition a dozen agreements are nearing the final stages of negotiation.

Little progress was made in the reservoir development phase of the river basin studies program. Congress did not act on the bill, S. 40, to authorize recreation development at reclamation reservoirs.

Seashore study.—Donated funds made it possible to launch a study to identify the major remaining opportunities to conserve natural seashore or coastal areas on the Atlantic and gulf coasts. The study, conducted in close cooperation with the States, will require a year or more to complete. Full consideration is being given to areas valuable for unique or rare plant and animal communities. Donated funds are also largely supporting a comprehensive 2-year scientific study of the Cape Hatteras National Seashore, under cooperative agreement with the Office of Naval Research and the University of Louisiana Institute of Coastal Studies.

Alaska recreation resources survey.—This study, begun in 1950, is complete except for final preparation and publication of some of the reports. The two volumes of part I of the overall report—Economic Aspects of Recreation in Alaska, and Analysis of Alaska Travel with Special Reference to Tourists—were published during the year.

As part of the survey, the Service undertook an investigation of the Kongakut-Firth River area in northeast Alaska in cooperation with the Office of Naval Research, which sponsored the project, the Geological Survey and the University of Pennsylvania. The report recommends protection of the area for research and appropriate wilderness recreation. The Service also participated in and gave general direction to a cooperative study of the human and natural history of Katmai National Monument, which is being continued this summer.

Cooperation with the States.—The Service has continued to make available to the States a wide variety of advisory and consultative assistance in their park and recreation problems. In addition to many other services, such assistance was given on 193 occasions to 40 States. A Service study of the Illinois-Mississippi Canal in Illinois, undertaken for the State, recommended that the canal be transferred to the State for administration as a through recreational waterway.

Publications issued included State Park Statistics, 1953, and a leaflet, Public Recreation Areas in the Vicinity of Washington, D. C. A Digest of Laws Relating to State Parks and Recreation was prepared under contract.

WINTER USE OF WESTERN PARKS INCREASES

An upsurge in winter use of certain western national parks and public pressure for improvement of year-round facilities in others was an important development of the year. In Yosemite National Park, a new winter-visitation record was set in its Badger Pass ski area. From December 19, 1953, to April 18, 1954, a total of 98,662 visitors were recorded as compared with 93,186 the previous year. Enlargement of the Badger Pass Ski Lodge and some slope improvement has been proposed.

At Hidden Valley ski area in Rocky Mountain National Park, 7,790 cars carrying 31,160 visitors were counted from mid-December 1953 to April 25, 1954. Of these, 7,714 were skiers. The Service has undertaken studies preparatory to improving skiing conditions at Hidden Valley. The director, however, has informed the Hidden Valley Development Committee that a permanent chair-lift ski tow would conflict with Service policy and was not being approved.

Winter activities, primarily skiing, continued in a limited degree at Sequoia, Mount Rainier, Lassen Volcanic and Olympic National Parks and to a lesser degree at Crater Lake National Park. In Olympic, where the Hurricane Ridge Lodge has been completed, studies were expected to get under way soon for a proposed winter use area at Hurricane Ridge. It was hoped that construction there could be finished coincidentally with completion of the Heart of the Hills Highway which will lead to the area. A study for a minor winter use development in the Manzanita Lake area of Lassen Volcanic National Park was completed during the year.

DEDICATIONS AND PAGEANTS

Perhaps the most interesting celebration to occur in a national historical area during the year was the dedication of the George Washington Carver National Monument as a memorial to the life and accomplishments of the famed Negro scientist. At the dedication ceremony in July 1953, the Secretary of the Interior and the director were speakers, joining the local community and its representatives in this important event.

Wright Brothers National Memorial was the scene of an elaborate 3-day celebration of the 50th anniversary of the first flight of a heavier-than-air machine. Almost every leader in the development of flight was present and participated in the ceremonies.

Community pageants were again presented in several of the historical areas during the summer season of 1953, including the Lost Colony at Fort Raleigh National Historic Site, Sword of Gideon, a drama of the American Revolution given at Kings Mountain National Military Park, and the Hiawatha Pageant offered at Pipestone National Monument.

PARKS IN AND NEAR THE NATION'S CAPITAL

The National Capital Parks comprise one unit of the National Park System. It administers a system of parks, monuments, memorials, roads, and parkways in the Nation's Capital and sizable acreages outside metropolitan Washington. In these areas, the total of 6,043,386 visitors in 1953 showed an increase of 963,784 over 1952 when 5,079,602 were recorded.

Of significant importance was the progress on construction of the Baltimore-Washington Parkway and the transfer of certain lands to the State of Maryland, mentioned in more detail elsewhere; the reconstruction of Beach Drive, scheduled for completion in August 1954, and improvements to the House Where Lincoln Died and in the east wing of the White House. A contract was awarded for demolition of 42 wartime temporary buildings at Fort Washington, Md.; completion of this work will make the large riverfront portion of the 341-acre tract available for park purposes. The old fort, several historic houses, and representative examples of other seacoast defenses located in the area will be retained for exhibits.

Washington carillon.—The 49 permanent full-size bells of the Washington carillon, a gift of the people of the Netherlands to the people of the United States, were officially presented on May 5, 1954, in ceremonies at the temporary carillon site in West Potomac Park. Dr. L. G. Korstenhorst, chairman of the Second Chamber of the States General of the Netherlands and chairman of the Bells for America Committee, made the presentation. The Hon. Joseph W. Martin, Jr., Speaker of the House of Representatives, accepted the gift for the United States. Assistant Secretary of the Interior Orme Lewis was host and chairman for the event.

Ford's Theater.—The 83d Congress enacted legislation signed on May 28 directing a study and cost estimate on the restoration of the historic Ford's Theater as it was on April 14, 1865, the date President Lincoln was assassinated. The study, to be undertaken early in fiscal year 1955, will also include a cost estimate for reinstallation of the Oldroyd collection of relics.

Dutch elm disease.—The Dutch elm disease, which threatens the elm tree population in the Nation's Capital, continues to worsen. Of 276 cases located in the District in fiscal 1954, 50 were on National Capital Parks property where control procedures were continued. Elimination of the disease will be possible only by adequate scouting and control procedures on a citywide basis and the Service continues to urge the District government to give this matter serious attention.

FINANCE AND ACCOUNTING

Expansion of the Service's workload incident to the tremendous increase in park use was again recognized by Congress by modest increases in fiscal year 1954 appropriations. The total of $33,853,850 provided was divided as follows: $8,869,550 for management and protection; $8,300,000, maintenance and rehabilitation of physical facilities; $13,916,300, construction of parkways, roads and trails, buildings, utilities, and similar facilities; $1,500,000 for liquidation of a previous highway contract authorization; and $1,268,000 for general expenses including $83,000 in supplemental appropriations for a United States Park Police pay raise.

Improvements in accounting.—Two years ago, the first step was taken in decentralizing to the field authority and responsibility for many fiscal matters. Other improvements are under way as the result of a survey of accounting, fiscal, and reporting operations and procedures completed in 1953–54 in cooperation with the General Accounting Office and the Department's Budget and Finance Division.

The principal changes that have been effected or will be in the next fiscal year are: (1) Reduction and consolidation of field accounting from 48 small offices to about 28 offices servicing a larger number of areas, resulting in a substantial saving in costs and releasing needed funds for essential park operations; (2) provision for a complete accounting entity at each accounting office by decentralizing certain functions from Washington to the field; (3) reduction of the number of allotment accounts by maintaining accounts only for each primary appropriation activity with appropriate cost accounts at the subactivity level, giving superintendents a wider latitude for the most advantageous use of of funds; and (4) consolidation of budget submissions and accounting reports at the regional office level with regional directors given authority to effect adjustments in funds, personnel, and equipment as needed by the various areas.

Fees revised to produce more revenue.—Acting upon a suggestion of the Bureau of the Budget in November 1953, a major revision in the schedule of fees collected from park visitors was accomplished and the changes were effected as of June 16. Fees in many areas were increased; in others, adjustments were made in line with increased costs of providing visitor services and facilities. Other changes were made to provide a more equitable fee structure depending on the area and the different types of services and facilities.

One of the difficulties of fee collections in the past has been the lack of sufficient personnel to staff entrance checking stations the full time it would be productive to do so. The 1955 appropriations bill provides for additional seasonal personnel for this purpose. It is anticipated, therefore, that the increased fees and the added staff to collect them will increase Service revenues by approximately $1,000,000 annually.

Utility services on reimbursible basis.—During the year, the Service formulated and established uniform criteria with respect to rate schedules concerning the sale of all types of utility services to concessioners, contractors, permittees, and other authorized users. As a result, new utility rate schedules have been established throughout the Service, and, by legislative approval, utility services will be furnished to users on a reimbursable basis. This permits financial flexibility in working out satisfactory utility arrangements in the field areas and will provide the Service with approximately $180,000 annually in appropriation reimbursements to offset the cost of the services. Previously, collections from utility sales were credited to general fund revenues and were not available for park operations.

PUBLIC BENEFACTIONS

Donations by public-spirited citizens and organizations of moneys, lands, historically significant properties, and other assets have greatly increased the value of the national heritage over the years. In fiscal 1954, monetary donations for general and specific purposes, several of which are mentioned elsewhere, amounted to a total of $442,745.42, in addition to many direct gifts of lands and historical objects. Also, $1,585 was donated to the fund for the preservation of the birthplace of Abraham Lincoln, and the National Park Trust Fund was increased by an amount indicated below.

Unfortunately, space is lacking to acknowledge individually the numerous generous contributions of lasting value to present and future generations. The National Park Service wishes, however, to express grateful thanks to all the benefactors in behalf of the American people.

National Park Trust Fund.—In 1935, the Congress established the National Park Trust Fund Board, with authority to accept donations of personal property "for the benefit of, or in connection with, the National Park Service, its activities, or its service." The first concerted effort to build up the limited resources of this fund was launched during the year with issuance of The Fifth Essence, a handsome brochure published by the Trust Fund Board with funds donated for the purpose. This book, written by Freeman Tilden, calls attention to the possibilities the fund offers for contributions from corporations and individuals as authorized by Federal tax laws. It indicates some of the needs of the Service unlikely to be met with appropriated funds and the opportunities these present for lasting public service. As a result of initial distribution of the book and other continuing efforts, the fund was increased by donations of $9,997.05.

With accrued interest of $952.94, a total of $10,949.99 was added during the year. Authorized fund expenditures totaled $3,500, used for appraisal of certain privately owned lands within Grand Teton National Park.

A future prospect.—It appeared likely at the end of the year that another substantial gift would be received from John D. Rockefeller, Jr. The 1955 appropriation bill, at the White House awaiting the President's signature on June 30, contains a $500,000 amount which will satisfy the proviso in Mr. Rockefeller's offer of $500,000 for general land acquisitions when a like sum is received. A plan for a land acquisition program for use of the $1,000,000 has been prepared in anticipation of this fund.

PERSONNEL MANAGEMENT

Personnel staffs were faced with a tremendous position classification workload during the year due to reorganization of the Service and other factors. Also, emphasis was placed on developing a forward-looking personnel management program through occupational studies, training courses and new training manuals.

Inservice transfers and promotions, especially in the field of supervision, were particularly numerous. A total of 657 position-descriptions were prepared and the positions allocated by May 31. Of these, 181 were reorganization allocations. By the end of the year, position classification work and related actions on the reorganization has been substantially completed for the Washington office and the design and construction field offices. Again, as in 1953, the Whitten amendment required review of all existing positions which resulted in submission of 160 redescriptions.

Other important moves included a general study of superintendent positions, revision of park ranger class specifications, and preliminary work on two proposed new classification series of park specialist and park administration. In anticipation of legislative action whereby the Civil Service Commission would become the wage-fixing authority for Federal Government per diem employees, a file on wage rates and wage-fixing practices in the Service's field areas was being compiled for use by the Commission.

Seasonal employee examinations.—In keeping with the Civil Service Commission requirements, promulgated during the year, that the Service recruit seasonal uniformed personnel through competitive examination, boards of examiners were established in each of the four regional offices. These boards handled the registers for seasonal rangers, ranger naturalists, ranger historians, and ranger archeologists. At the end of the fiscal year it was still too early to evaluate the results of the new procedure.

Employee training.—The Service conducted its 12th general administration training course in the Region 2 office in Omaha from October 19 to October 31, 1953. The 25 employees participating were instructed in all phases of Department and National Park Service policies, management, and operation. Benefits of the course were extended by requesting park superintendents to organize field groups through which those who had completed the course could train other area employees. A total of 293 employees have completed the course since 1940.

Four outstanding field employees were selected by the Service to participate in the fifth departmental management training course in Washington, D. C., from September 1953 to the end of April 1954. After a 4-week orientation course, the trainees undertook on-the-job training assignments in the National Park Service and other offices of the Department.

Numerous other training courses, some of which are mentioned elsewhere, were held by technical units, regions, and areas to promote greater employee efficiency.

The Service's training officer was selected to attend the 53d session of the Federal Bureau of Investigation National Academy, March 22–June 11, a course which will enable him to increase the effectiveness of field-employee training in law enforcement procedures and techniques.

Noteworthy accomplishments were the preparation and issuance of a Guide to Supervisory Development, a field-level supervisory training manual, and an Information Handbook, for field personnel having public-contact duties and for training seasonal employees. Both were being put to good use in the field.

THE ADVISORY BOARD

The Advisory Board on National Parks, Historic Sites, Buildings, and Monuments held two meetings during the year on Service matters and continued to give invaluable advice and assistance. On July 1, 1953, two new board members, Walter L. Huber of San Francisco, civil engineer and conservationist, and Harold S. Wagner, director-secretary of the Akron (Ohio) Metropolitan Park System, were appointed by the Secretary of the Interior. They replaced Dr. Ralph W. Chaney, professor of paleontology of the University of California, and Tom Wallace, editor emeritus of the Louisville (Ky.) Times, whose terms expired on June 30, 1953. Mr. Huber is an honorary vice president and former president of the Sierra Club of California. Mr. Wagner is a board member of the American Institute of Park Executives and a life board member and former president of the National Conference on State Parks.

OUTSTANDING NATURAL PHENOMENA

Kilauea erupts.—The 2-year quiescence of Halemaumau, fire-pit of Kilauea Volcano, Hawaii, was broken at 4: 10 a. m., May 31, by a spectacular eruption which produced a molten fountain of lava 600 feet high. Within 30 minutes, a half-mile-long fissure broke open on the floor of Kilauea Crater—the first such occurrence in the parent crater since the mid-19th century—and lava fountains gushed 100 feet high. The Halemaumau fissure extended northeast-southwest across the 100-acre floor of the pit, and the Kilauea outbreak continued along the same line. Fifteen minutes after the activity began, the entire sky was aglow with bright orange-red smoke and fume clouds rose rapidly to 30,000 feet; the fire-pit and parent crater were boiling cauldrons.

The eruption subsided as quickly as it began. Within 8 hours, the highly spectacular phenomenon had simmered to irregular extrusions of spatter. By noon of June 4 activity ceased. The new 4,500,000 cubic-yard deposit of lava in Halemaumau raised the floor of the crater 20 feet—within 450 feet of the rim; 500,000 cubic yards of lava were deposited on the Kilauea Crater floor.

In the first 24 hours after it started, some 15,000 persons witnessed the eruption. Park personnel, assisted by Hawaii County police, installed portable fences, roped off danger zones, and established a one-way traffic pattern. Many visitors watched the activity from Volcano House and Uwekahuna Overlook where views of the scene were particularly spectacular.

Mount Trident eruption.—Mount Trident, in Katmai National Monument, Alaska, continued through the 1953 summer season the eruption which began in February 1953. The phenomenon was under observation by the field research team studying volcanic and seismic forces, plant and animal ecology, ethnology, and archeological remains in the monument.

Landslide creates new lake.—A large landslide in Stony Creek Canyon, Mount McKinley National Park, Alaska, in the summer of 1953 formed a dam in the creek bed, creating a lake above the slide, which is now a half-mile long. The slide was discovered on July 18, 1953, by an airplane pilot flying over the area. The cause is unknown, though the mountain face exposed shows that the material slid from a layer of permafrost, probably thawed by heavy rains and loosened by earthquakes active at the time.

River bank swallowed.—At Pittsburgh Landing, Shiloh Military Park, historic scene of General Grant's successful 1862 battle leading to the siege of Vicksburg, floodwaters of the Tennessee River-Kentucky Lake section carried 20,000 cubic yards of river bank into the rushing waters in February 1954. Several large trees and 55 feet of the Pittsburgh Landing loop road went, too. Park officials have been consulting with Army engineers and the Tennessee Valley Authority in an effort to remedy the damage.

Blizzard traps motorists.—A severe blizzard on Trail Ridge Road in Rocky Mountain National Park, Colo., trapped 36 motorists for 12 hours on June 6. Park rangers and snow plows assisted the motorists in reaching safety.

Spectacular rookery displays.—A notable revival of several recently inactive rookeries in Everglades National Park produced spectacular displays of wood ibis, white ibis, and egrets.

OF SIGNIFICANT INTEREST

Challenge of the Mountains.—The high mountains in the national parks continue to provide a strong lure to the rugged and fearless. In Rocky Mountain National Park, 1,856 ascents of Longs Peak were recorded; of this number 111 climbed the peak's difficult east face. On June 5, Earl Harvey, 20, of Gretna, Va., fell to his death while climbing the peak. New records in climbs and numbers of climbers were set in Grand Teton National Park. In Mount McKinley National Park, in the central Alaska wilderness, of the 11 persons in 3 parties attempting the difficult climb to the 20,300-foot summit of Mount McKinley—highest peak in continental North America, 6 were successful. One four-party group, led by Elton Thayer, reached the summit May 15 thereby establishing a new record of a first-time successful climb via the South Buttress route.

The success of the Thayer party ascent was dimmed by a fatal accident in descending when the four fell, slid, and tumbled more than 1,000 feet from the 13,800-foot Karstens Ridge. Thayer was killed instantly, and George Argus seriously injured. The other two, Leslie Berieck and Morton Wood, brought Argus to a safe place on Muldrow Glacier at 11,000 feet and walked out for help. Rescue was effected with the help of a civilian climbing group, members of the Arctic Indoctrination Center at Big Delta, and the 74th Air Rescue Squadron from Ladd Air Force Base.

The Service continues its policy of requiring climbers to obtain permission from the superintendent before attempting the more hazardous ascents and to report upon return. It assumes no responsibility or liability for mountain-climbing accidents, though its employees are frequently subjected to serious hazards, and the Service to heavy expense, in rescue operations.

Park ranger killed by rocks.—Charles R. Scarborough, assistant chief ranger of Yosemite National Park, was struck by rocks falling from Clark's Point Cliff while on a pack trip to Merced Lake. He and his horse were killed instantly, marking the first death of a permanent ranger while on duty in Yosemite.

Visitor accident.—A serious accident occurred in Mount Rainier National Park March 17 when Miss Delores VanParys, 17, of Seattle, fell from the parapet above Narada Falls to which she had climbed. Slipping and falling 179 feet to the bottom of, and beyond, the falls, she was critically injured but it was reported later she would recover. Rescue was effected by rangers and Air Force personnel who happened to be at the scene.

Horse Roundup.—A unique method of enforcing grazing trespass regulations in Theodore Roosevelt National Memorial Park brought good results but some temporary confusion in the minds of park friends. Because certain stockmen ignored notices to remove their stock from the park, a horse roundup was conducted April 30–May 2. Widely publicized through efforts of the Greater North Dakota Association, the event was misinterpreted by some as a "wild horse" roundup and the Service was criticized for "removing wild horses from the park." Large crowds gathered and the event attracted nationwide newspaper and photographic coverage. No wild horses were found.

Official honored.—Assistant Chief Naturalist H. Raymond Gregg of the Washington office was elected Fellow of the American Association for the Advancement of Science on June 2, 1954.

Office of Territories

William C. Strand, *Director*

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THE second year of a new administration of the territorial responsibilities of the United States has been a year of accomplishment and progress.

The Alaska Railroad moved from a $42,000 loss in fiscal year 1953 to a $766,000 profit in fiscal year 1954.

Through the sale of hundreds of houses and other property items the affairs of the Puerto Rico Reconstruction Administration were brought to a final stage of liquidation.

With the support of the Department a revised organic act was passed for the Virgin Islands which will place the administration of that island on a sound and forward-looking basis.

Also, in the Virgin Islands Bluebeard's Castle Hotel was sold and the Virgin Islands Corporation began the disposition of 800 acres of land to small farmers.

Active support was given to bills passed by Congress effecting the transfer of certain military lands to the Territory of Hawaii and authorizing the issuance of public improvement bonds to finance the extension of electrical service in the island of Kauai.

The trust territory government was greatly strengthened by moving several of its departments to locations in the islands and by a decision to move Honolulu headquarters to Guam pending the establishment of headquarters in the trust territory itself.

Substantial progress was made in securing Federal mortgage money for Guam housing developments. Cordial relations with the military on the island were greatly strengthened.

The last fiscal year saw the transfer back to the Department of the Navy of all the islands of the northern Marianas except Rota.

The governors of our Territories have given wise and aggressive leadership to the task of finding orderly solutions to territorial problems. They have been strongly supported in their work by field officers of the office of the Territories, and by island territorial officials, with a minimum of reliance upon Washington.

During the year the office of Territories has been diligent in cooperating with the Department's policy of eliminating nonessential and extravagant Federal functions.

In Alaska commissary operations of the Alaska Railroad, born of a pioneer period when retail facilities had not been established, have been eliminated because their reason for existence has long since disappeared. The railroad has leased its proprietary interest in a large power plant to an electrical cooperative in the Anchorage area and is planning to dispose of this interest to the same cooperative at an early date.

In the trust territory the office is carrying out a congressional directive to discontinue its trading operations in copra, and in Samoa a government-owned fish cannery has been leased for private operation.

The battle for statehood for Hawaii to which the office of the Department gave wholehearted support was unfortunately unsuccessful. That battle will be continued with vigor, however, until self-government on a statehood basis has been achieved.

Governmental problems in Alaska are more complex because of military necessities, the dominance of the Federal Government as a landowner, and the small size of the population. During the year Governor Heintzleman has taken the lead in pointing out positive solutions to the problems which these conditions have produced.

The year saw the completion of a $50,000,000 pulp plant near Ketchikan which is giving new life to business in southeastern Alaska, an accomplishment which owes a great deal to the vision and initiative of Alaska's Governor.

As a part of an overall program for increasing the effectiveness of the work of the Department, a special survey team made a careful review of the work of the office of Territories and recommended changes in its administrative organization. Under the revised administrative setup the work of the Caribbean and Pacific Divisions was consolidated in a new Insular Division. The Alaska Division was reorganized to include all operating functions in Alaska except public works. The Alaska and Virgin Islands public works programs are now being directed by the office under a public works adviser.

There follows a more detailed review of territorial highlights for the past fiscal year.

ALASKA

Statehood

Legislation to provide for the admission of Alaska to the Union was introduced in both Houses of the 83d Congress. The Alaska legislation was approved by the Senate as an amendment to the Hawaii statehood bill. The combined bill was returned to the House for consideration of the Senate amendments, but by the close of the fiscal year no action had been taken.

Industrial Development

The opening in 1954 of the Ketchikan Pulp Co.'s high alpha dissolving pulp plant at Ward Cove, Alaska, marked an historic turning point in the economic and industrial life of the southeastern area. This pioneering venture was undertaken by the Puget Sound Pulp & Timber Co. of Bellingham, Wash., and the American Viscose Corp. of Philadelphia and New York at a cost of about $50,000,000. Alaska has been dependent to a large extent upon seasonal industries with no major manufacturing or processing enterprises to provide steady year-round employment and activity. This new plant will play a major role in the growth and stability of the Territory.

The Alaska Railroad

The Alaska Railroad continued to improve its facilities in fiscal 1954 to the extent that funds were available. Many changes were made in tightening up the railroad's operations during the year and every effort was made to curtail expenses. A greater volume of freight was moved than ever before but freight revenues were under 1953 because of the lower rated tonnage carried and a decrease in ton-miles. As of June 30, 1954, there were 1,896 employees on the payroll which is a decrease of 460 compared with the 2,356 on June 30, 1953. A highlight of the year was the appropriation by Congress of funds for the rehabilitation of the line from Seward to Portage and for the completion of a new dock at Seward. Plans for both projects were well advanced at the close of the fiscal year.

Effective June 1, 1954, the railroad commenced free delivery of all less-than-carload freight within the city limits of Anchorage and Fairbanks and to developed areas outside of the city limits. This change has provided an important new service, which has been well received by Alaskan consignees and shippers.

In November 1953 the Secretary of the Interior appointed a survey team to review the management and operations of the railroad. The recommendations of the survey team were approved by the Secretary and are being put into effect by the general manager in order to establish a more efficient organization. A major recommendation now being carried out by the railroad involves the disposal of surplus property acquired after the war without exchange of funds and which was accumulated far beyond current and anticipated needs.

A program for the retirement of outmoded equipment included the disposition of practically all old off-track equipment and ancient and unusable freight cars. In an effort to provide better equipment for wrecking crews, two surplus outfit cars were outfitted to replace the old wooden coaches previously used. Six additional 1500 Class diesel locomotives were received in January 1954 and 280 hopper cars were placed in service during the year. The new Anchorage yard office was completed, as well as an addition to the Anchorage fire hall. Installation of new track scales, commenced in 1953, was completed. On October 15, 1953, a new main track, running north from the passenger depot past the freight house and bypassing the yards, was placed in service. This permits yard crews to work without interference since the main line formerly extended through the yards.

The Alaska Road Commission

The Alaska Road Commission's extensive program of highway improvement, construction of new roads, and maintenance of the existing system, was vigorously prosecuted during the 1954 fiscal year. At the end of the year, the road commission network totaled 3,482.4 miles of highway. During the past fiscal year, 60.5 miles of new roads were constructed, 162.5 miles of main highway were improved to a 50-mile per hour standard, and 50 miles were surfaced with a flexible asphaltic mat, increasing the total paved system to 715 miles. Of the commission's total road mileage, 1,868.2 miles were kept open to traffic throughout the year. For the first time in the history of Alaska's highways Isabel Pass on the Richardson Highway was kept clear of snow during the winter months. This reduced the wintertime truck haul from Valdez to Fairbanks by 100 miles.

The Glenn Highway between Anchorage and Glen Allen Junction is now paved, and the entire length of the Tok Cutoff portion of the Glenn Highway is under contract for paving. During the fiscal year the last 42 miles of the Richardson Highway was placed under contract for reconstruction prior to paving. Only one 44-mile section of the Alaska Highway remains to be reconstructed, and this section is scheduled for early contract award. Paving of the Seward-Anchorage Highway was completed. The initial contract for construction of 15.88 miles of the new Copper River Highway was completed, and a contract for construction of the second section crossing the Copper River Delta has been awarded.

Construction by force account of the 160-mile Taylor Highway continued. Although not yet developed to final standard, this route is passable for its entire length from its junction with the Alaska Highway to Eagle, Alaska, and Dawson, Yukon Territory. The new Denali Highway to connect Mount McKinley National Park with the highway network is also being constructed by force account and 33.5 miles were built during the year. Petitions for the construction of access roads to homesite, farm, mining and industrial areas exceeded available funds by approximately 500 percent. Approximately 40 miles of such roads were built during the year.

Progress in Public Works Construction

In 1949, by Public Law 264, Congress authorized a $70 million program of public works in Alaska for rapidly growing Alaskan communities and in 1954 extended the expiration date of the program to June 30, 1959. By the end of the fiscal year $41,208,200 had been appropriated to permit the construction of 80 projects.

All but two of the 50 projects estimated to cost $15,885,330, for which funds were made available from appropriations in the fiscal years 1950, 1951, and 1952 (with the exception of minor finishing touches on one project) have been completed. Of the other two, one is three-fourths complete and the other is underway.

Completed projects include 16 schools, $5,875,000; 3 health centers, $112,000; 5 other public buildings, $2,280,000; 11 water system projects, $3,750,000; 5 sewer system projects, $704,000; 4 combined water and sewer projects, $940,000; 2 streets and sewer projects, $1,170,000; 3 street projects, $825,000; and, at the University of Alaska, a classroom and office building, a dormitory, and utilities costing $1,040,000.

In the 1953 program $12,242,900 was allocated for 12 projects. Of these, 4 estimated to cost $1,789,300, have been substantially completed and 4 others, estimated to cost $5,875,000, are more than half completed. Three of the remaining four projects are well underway and the fourth is to be started at once.

A total of $11,788,000 was allotted for 17 projects for the 1954 program. It is expected that by the end of the 1954 season, 11 of these, estimated to cost $8,346,000, will be under construction. Four of the other 6 projects will be started before the end of the calendar year 1954 and the other 2 with the opening of the 1955 construction season.

There has been appropriated $9,500,000 for the Alaska public works program for the year beginning July 1, 1954. This amount brings the total appropriations to date to $50,708,200, and provides funds for 18 additional projects.

Expansion in Coal Production

The growth of the military establishment in Alaska following the Korean outbreak greatly increased the demand for coal mined in the area served by the Alaska Railroad. There are two major coal fields in this area, the Healy River field about 75 miles southwest of

Fairbanks, and the Matanuska field about 60 miles northeast of Anchorage. In response to rapidly mounting demand, coal companies in these fields nearly doubled their production in the 3 years following 1950 and produced an estimated 900,000 tons in the calendar year 1953.

In order to construct realistic production goals, in view of the wide range of military estimates as to consumption requirements, the Secretary of the Interior appointed a survey team to undertake an investigation. This study covered military and civilian requirements, existing mine capacity, need for new mines, problems of transportation, manpower and financing, as well as a review of Government leasing regulations and conservation practices. The survey will provide guidance in the development of programs by the Department of the Interior to increase coal output in the Territory in response to essential needs.

Territorial Health Survey

The special field survey of Alaska health problems, under the direction of Dr. Thomas Parran, former Surgeon General of the United States, was continued in this fiscal year. This survey was initiated in the summer of 1953 to aid the Department of the Interior in planning a sound program to meet the general health and hospital problems in Alaska, with particular emphasis on combating the spread of tuberculosis. It is being made with the assistance of territorial and Federal agencies.

In a preliminary report, based on last year's survey, Dr. Parran and his associates recommended that an emergency program be launched to meet the tuberculosis problem with primary attention given to natives in outlying areas who are unable to receive hospital care. The use of isoniazid (IHN), a drug which has proven a definite value in a substantial number of active tuberculosis cases when administered orally, was recommended. The purpose of this program is to determine whether the use of IHN will result in a significant reduction of active cases.

A final report to the Secretary of the Interior will be submitted in December 1954 and will cover control of tuberculosis and infectious diseases, sanitation, mental health, nursing, maternal and child health, and programs for crippled children as well as hospital and medical care.

Care of the Mentally Ill

Persons legally adjudged insane from the Territory of Alaska have been cared for at Morningside Hospital in Portland, Oreg., under contract with the Department of the Interior for approximately 50 years. At the beginning of the fiscal year 345 patients were under such care. The Department has recommended legislation which would modernize antiquated commitment procedures and establish improved administration of the mental health program. The recommended legislation was passed by the House but had not been acted upon by the Senate at the close of the fiscal year.

HAWAII

The Department's efforts for Hawaii throughout the period of this report were concentrated on securing passage of statehood legislation. H. R. 3575, passed by the House of Representatives last year, was approved by the Senate on April 1, 1954. The Senate version, however, contained an amendment extending statehood also to Alaska. The Senate called for a conference at which the differences might be resolved, but the bill was tabled by the House Rules Committee and consequently failed of enactment.

The Department was successful, after a serious drought emergency developed, in having Hawaii declared a civil disaster area eligible to receive Federal aid. Toward the end of the year, the Department also took steps to obtain Federal aid to ease the rising unemployment problem.

A number of bills having the active support of this Department were passed by the Congress. They included an authorization for the exchange of certain public lands for privately owned lands of equal value, the transfer to the Territory of certain Federal lands held by the military, and laws authorizing the issuance of public improvement bonds and permitting the extension of electric service to parts of the island of Kauai.

GUAM

In the 4 years that Guam has been under the administrative jurisdiction of the Department of the Interior the territorial government has grown increasingly capable of meeting local needs. Activities of the office of Territories during the fiscal year consequently have been generally limited to situations requiring intercession with other executive agencies having responsibilities in Guam and to the field of legislation.

Although the Federal housing laws had been amended in the previous fiscal year to permit residents of Guam to obtain loans insured by the Federal Housing Administration, the construction of large-scale housing developments continued retarded for lack of private sources of long-term financing. Early in the fiscal year the Department therefore appealed to the Federal National Mortgage Association to make commitments to purchase mortgages on Guam projects. One such project consisted of about 600 dwelling units to be built at a total cost of about $6,500,000. Since it appeared toward the end of the fiscal year that all FNMA funds would be committed to other projects, steps were taken to include in the Senate version of the housing bill a provision earmarking $15,000,000 for use on Guam. While this provision was deleted by the conference committee, it was understood that Guam housing needs would be met under the special assistance clause of the Housing Act of 1954. This empowers the President to instruct the FNMA to allocate parts of a $200,000,000 fund for use in areas of extreme housing shortage.

The Guam omnibus bill embodying amendments to Federal laws recommended in 1951 by the President's Commission on the application of Federal laws was again introduced at the request of this Department as H. R. 10131. Its introduction, however, came too late for affirmative action by the 83d Congress. The Congress did enact H. R. 8634, to amend section 22 of the Organic Act of Guam so as to make unnecessary trial by jury or the prosecution of offenses through indictment by a grand jury in the District Court of Guam. Since the legal traditions of Guam stem from Spain, where the jury system is not used, this bill merely perpetuated the existing situation and clarified the intent of Congress with respect to this section of the organic act.

For the first time since the enactment of the Organic Act of Guam in 1950, the President was called upon to act on a bill twice vetoed by the Governor. The bill involved was entitled "An Act to provide for the censorship of motion pictures." On the ground that approval would constitute an encroachment on the basic freedoms guaranteed by the 1st and 14th amendments of the Constitution, the President upheld the Governor's veto.

During the year court action was taken upholding the validity of the Federal income tax imposed in Guam. The Ninth U. S. Circuit Court of Appeals in San Francisco upheld the 1951 decision of the U. S. District Court for Guam, and a petition for certiorari was filed in the Supreme Court. At the end of the fiscal year the Supreme Court had not decided whether it would hear the appeal.

AMERICAN SAMOA

As an unincorporated unorganized territory, American Samoa and its government have continued to require close supervision by this Department. Lawrence M. Judd, the fourth Governor since the transfer to civilian administration in 1951, was forced by illness to retire on July 31, 1953, and Richard Barrett Lowe was named by the Secretary to succeed him.

Perhaps the most significant political development of the year was the passage of a resolution by the Fono petitioning the Governor and, through him, the Secretary to establish a constitutional committee to study, draft, and recommend proposals for a territorial constitution. Such a committee was established and at least one meeting was held before the close of the fiscal year. It is expected that the Samoans will, through this committee, work out for themselves many of the questions that have in the past caused them to oppose organic legislation. The Fono repeatedly had gone on record as needing time to inform itself of the implications of government under terms of any organic act that might be passed by the United States Congress.

The economy of American Samoa is primarily agricultural with two main sources of income copra and handicrafts. During the year concerted effort was made to broaden the territory's economic base through the introduction of industries. In December the Government leased to the Van Camp Sea Food Co., Inc., of California, the fish cannery that had been standing idle since 1950. A firm manufacturing women's apparel has expressed serious interest in establishing a branch factory in American Samoa and sent a representative to the islands to review tax and other arrangements with the Governor.

One of the major deterrents to American Samoa's development is the lack of regular surface and air transportation. In April 1954 the President signed an order authorizing Samoan Airlines, a private concern headed by a Samoan, to operate on a weekly scheduled basis between Pago Pago and Apia and to provide charter service between Pago Pago, and Canton Island and Tahiti, respectively.

Topographic mapping has long been viewed as fundamental to long-range economic planning for the territory. At the end of the fiscal year arrangements were made with a New Zealand firm by the United States Geological Survey to take the necessary serial photographs for use in drawing up such a map.

TRUST TERRITORY OF THE PACIFIC ISLANDS

During the year considerable study was given to a number of basic organizational and administrative problems in the Trust Territory of the Pacific Islands. The purpose of these studies was to bring about maximum efficiency and economy in trust territory administration and, at the same time, to permit the establishment of governmental services at a level within the future capabilities of the islands to support.

As a result of organizational readjustments the number of established stateside positions was reduced during the year from 290 to 252. In a transfer of Government departments from Honolulu to the field, the department of public health was moved to Ponape, the department of education to Truk, and the fiscal and supply office to Guam. Careful consideration was also given to the question as to whether greater efficiency and economy could not be obtained by moving the high commissioner's office and the remaining small staff in Honolulu to Guam. A decision to do so on an interim basis was made late in the fiscal year, pending the time when a headquarters could be established in the trust territory itself, and steps were immediately taken to arrange for the move.

Effective arrangements for the continued collection and sale of copra and the distribution of trade goods to merchandising firms in the area, received much attention during the year. The Island Trading Co., which, as an instrumentality of the trust territory government has conducted these activities for the past 6 years, will terminate its activities in December 1954. During the year the Island Trading Co. and the high commissioner and his staff encouraged the strengthening of a locally owned company in each of the districts in order that these companies might successfully take over the trading company's functions. It is believed that these efforts have been successful and the only major problem remaining to be settled is that of the sale of copra on the world markets. Micronesian companies are not as yet sufficiently experienced to undertake this complex operation and, at the close of the year, procedures were under consideration to obtain the assistance of other private firms.

In an area as vast as the trust territory, satisfactory provision for transportation service represents a difficult problem. Prior to the beginning of the year the Department had arranged with the Air Force for the loan of three SA–16 Albatross aircraft to replace four PBY5A aircraft which could not be continued in use without major and expensive repairs. Since the SA–16 had never been used in a civilian operation, the Department requested the Civilian Aeronautics Administration to conduct certification tests on the aircraft. These tests revealed a number of modifications that would be required to meet certification standards. The Department then met with Civil Aeronautics Board officials to obtain waivers on certain of these modifications which it was felt would not affect the airworthiness of the aircraft in view of the special conditions under which they were to be operated. As a result the CAB issued a certification of the planes for use in the trust territory and at the close of the year the necessary modification of the aircraft was underway.

At the end of the year a very encouraging development in vitally needed surface transportation was an agreement with a transpacific shipping company to route a vessel by way of Majuro in the Marshall Islands. This will permit direct haul of copra and certain other goods from and to the trust territory without transshipment at Guam and should be of considerable benefit to the copra producers and to the trust territory administration.

Continued progress was made in discussions with other departments of the Government on certain long-standing issues. An agreement was made in October covering detailed arrangements for the transfer to the Secretary of the Navy of jurisdiction over the northern Marianas with the exception of the island of Rota. This transfer was made pursuant to Executive Order 10470 of July 17, 1953. There were also working level discussions as to an agreement with the military agencies regarding the terms under which land in the trust territory would be retained for military purposes. Steps were taken through the Department of State to bring about negotiations with the Japanese Government for the settlement of certain contractual type claims of trust territory inhabitants against Japan as a result of World War II.

Continued authority for civilian government in the trust territory was provided with the enactment of Public Law 451. This law extends governmental authorization until 1960 by which time it is anticipated that suitable organic legislation for the territory will have been adopted.

OTHER PACIFIC ISLANDS

Canton was visited by perhaps the highest United States Government official in its history on October 10, 1953, when Vice President Richard M. Nixon and a party of eight stopped en route from Honolulu to New Zealand on their trip around the world.

The United States Resident Commissioner on Canton signed a fishing permit which, upon cosigning by the British Resident Administrator, permitted a third company to establish fishing operations at Canton.

Preliminary discussions were held with the State Department and the Civil Aeronautics Administration regarding the supply of water, electrical power and medical services to the British and Gilbertese on Canton. This problem arose because of the anticipated termination of an airline lease for operation of the hotel on Canton.

THE VIRGIN ISLANDS

On April 9, 1954, the Honorable Archie A. Alexander was inaugurated as Governor of the Virgin Islands.

During the year the Department's activities on behalf of the islands were concentrated on bringing up to date the Organic Act passed in 1936. On July 22, 1954, the Congress enacted Public Law 517, known as the Revised Organic Act of the Virgin Islands. This act provides for the following major changes: the establishment of a unicameral legislature composed of 11 senators, 6 elected at large; the appointment of a commission to study the applicability of Federal statute to the islands; the preparation of a code of laws; and the appointment by the Secretary of the Interior of a comptroller.

The new act provides for the transfer to the Government of the Virgin Islands during each fiscal year of a sum equal to the total amount of the revenue collected by the island government from Federal internal revenue taxes on articles produced in the islands and transported to the United States. There will also be transferred to the islands' treasury during each of the fiscal years ending June 30, 1956, the sum of $1,000,000 or the balance of the internal revenue collections available after payments are made as provided above. The latter fund is to be used for emergency purposes and essential public projects only.

The Department was instrumental in having the Fulbright State scholarships program extended to the Virgin Islands this year. Under this program one Virgin Islander may be selected annually to receive graduate education abroad.

The Virgin Islands Corporation.—On December 29, 1953, Dr. Kenneth A. Bartlett succeeded Mr. Gordon Skeoch as president of the Virgin Islands Corporation which is wholly owned by the Federal Government. It has now reached the half-way mark under its 10-year charter with financial losses for the first 5 years amounting to $2,283,069, or an average of $456,612 per year. However, it has served as the backbone of the economy of the island of St. Croix, and without it, the Government in all likelihood, would have had to maintain a substantial relief program.

The growing of sugar cane and the production of sugar continued to be the most important operation of the Corporation. There was considerable improvement in sugar cane production during the year and field operations did not contribute substantially to the overall losses sustained. The production of sugar from cane presents a less favorable picture. The Corporation acquired a run-down and dilapidated sugar mill, which had not been adequately maintained. While substantial investments were made the mill has never been completely rehabilitated and continues to represent an inefficient factory operation. Every effort is being made to correct this situation as rapidly as possible. The board of directors has requested the Sugar Branch of the Department of Agriculture to prepare an analysis of its sugar operations and has under consideration a proposal to contract the management of the mill to a private firm.

The Corporation also owns a distillery, which is operated by the A. H. Riise Distillers Co. under lease. During the year the board voted to grant this company an option to purchase at fair value as determined by a board of arbitration. An arbitrated price of $60,000 was set and at the end of the year, negotiations were under way for sale of the plant.

Bluebeard's Castle Hotel has at last been sold and on July 1, 1954, was transferred to Antilles Enterprises, Inc. The hotel was constructed in 1934 as a public works project and was leased to private concerns until 1953 when the board decided to dispose of it. Antilles Enterprises, Inc., a Virgin Islands corporation, was the highest bidder, with a bid of $410,000 accompanied by an agreement to spend $150,000 in major capital improvements during the first 18 months of operation.

The corporation is responsible for a highly successful power operation on St. Croix and St. Thomas, which has shown a substantial profit since it was taken over in 1952. Generating capacity has been steadily increased, additional distribution lines have been installed, and rates have been reduced.

In accordance with its decision to dispose of 810 acres of corporation-owned land the board arranged with the Farmers Home Administration of the Department of Agriculture to distribute this land among 10 farmers selected from an eligible list of 15 contestants. As a guide to future action, the Corporation arranged for an annual comparison of the productivity of the land sold with that retained by the corporation.

A livestock program to improve and develop the cattle industry was continued on a small scale. An abattoir, owned by the corporation, was on lease to private industry for the slaughter of cattle for sale in Puerto Rico.

A land and water conservation program has been carried out in cooperation with the United States Department of Agriculture's Soil Conservation Service with outstanding results. Thirty earthen dams have been constructed in St. Croix, with a capacity for impounding over 200 million gallons of water. During the past year the dam construction program was extended to the islands of St. Thomas and St. John where 9 dams with an impounding capacity of more than 39 million gallons of water were built. The impounding of this water has provided water for cattle, which is sorely needed at times, and for some irrigation. Even more important, it has resulted in the general raising of the water table throughout the islands with indirect benefits which cannot be evaluated in dollars. Wells that have been dry for years are now usable while others are supplying more water at a much less depth than heretofore. This program also includes the clearing of land which has been allowed to go to brush over the years. More than 21,000 acres have been cleared for restoration as productive agricultural land.

A small fund was appropriated for tourist development and, through the Virgin Islands Tourist Development Board, was used for the printing of the Virgin Islands Magazine for free distribution to thousands of travel agents, airlines, etc., throughout the United States.

At the June meeting of the Board of Directors, the Virgin Islands Corporation received authority to manage, if necessary, the submarine base and airport at St. Thomas presently held by the Department under revocable permit from the Navy. The facilities consist of three types of operations: management of the airport, operation of the water department, and the rental of buildings to private individuals.

Construction of Public Works.—Beginning in 1944 Congress authorized a public works program in the Virgin Islands for which a total of $11,303,592 has since been appropriated. No additional appropriations will be made since, under the Revised Organic Act, the Virgin Islands Government will construct its own public works.

The fiscal year 1954 witnessed the completion of a mile-long seawall along the shore of Charlotte Amalie Harbor and of a sewage lift station in the Long Bay housing area of St. Thomas. The formal transfer to the Virgin Islands Government of facilities completed earlier included a potable water system, sanitation and fire protection projects, and road and telephone communications systems on St. Thomas and on St. Croix.

Construction of two high schools, one in Charlotte Amalie, St. Thomas, and the other in Christiansted, St. Croix, has progressed so well that they will be completed early in 1955. During fiscal 1954, contracts were awarded and construction was well under way on several additional schools. A secondary road on St. John connecting Cruz Bay on the east coast with Coral Harbor, on the west coast, approximately 9 miles in length, is nearing completion and will be opened to traffic early in 1955. Final projects in the program, for which plans and specifications have been completed, include five additional schools and a highway back of the seawall in Charlotte Amalie.

PUERTO RICO

Puerto Rico Reconstruction Administration.—With the establishment of the Commonwealth Government, the Department's activities in Puerto Rico have been largely confined to the liquidation of the affairs of Puerto Rico Reconstruction Administration.

Joint resolution (Public law 276), authorizing and directing the Secretary of the Interior to liquidate the Puerto Rico Reconstruction Administration within 18 months from the date of enactment, was approved by the President on August 15, 1953. In compliance therewith the Secretary of the Interior authorized the granting of discounts on the balance due on the purchase of certain lands and urban and rural houses, as an inducement to complete all purchases by June 30, 1954. As a result sales of housing units during the authorized discount period amounted to 527 urban and 7,520 rural units with total receipts of $1,422,384. Expenses amounted to $183,193. There remains 222 urban and 874 rural houses still to be disposed of during the next fiscal year.

The proceeds from the sale of coffee and other crops produced on the Castaner farm amounted to $72,860.94, while the operating expenses amounted to $38,825.39, leaving a net profit of $34,035.55. The farm continued to furnish seasonal employment to more than 200 families.

No loans were made to cooperatives during the past year. Cooperative Central de P. R., Inc., was fully liquidated. At the present time only four cooperatives, originally financed by this Administration, remain to be disposed of during the 1955 fiscal year.

Operations that vary little in kind from those of previous years were financed with allotments out of the Puerto Rico Revolving Fund for projects approved by the President, as follows:

Operation and maintenance of housing projects	$183, 500
Operation of Castaner farm project	39, 300
Servicing of loans to cooperatives	3, 700
General administration	164, 000
Repairs to buildings, etc	31, 400
Construction of 200 latrines	3, 000
Surveying and other services	18, 100
Reserve	20, 000
Total	463, 000

Training Program for Technical Assistance.—The Department of the Interior continues to serve as the Washington office of the technical assistance program for the Government of the Commonwealth of Puerto Rico, under a special agreement between the Secretary of the Interior and the Director of the Foreign Operations Administration.

The training program in Puerto Rico continued to expand during the fiscal year 1954. A total of 637 foreign nationals (including trainees, visitors and observers) visited the island between July 1, 1953, and June 30, 1954, an increase of 70 percent over the previous year. The area from which these foreign nationals came and their sponsorship is shown below:

Sponsor	Latin America	Near East, Africa, and South Asia	Far East	China and Indo-china	Europe	Total
Foreign Operations Administration	[1] 274	29	37	10	3	353
United Nations and specialized agencies	66	12	4		5	87
Organizations of American States	63					63
Other trainees	55					55
Foreign visitors	74	3			2	79
Total trainees and observers	532	44	41	10	10	637

[1] Includes Caribbean dependent overseas territories.

Office of the Administrative Assistant Secretary

D. Otis Beasley, *Administrative Assistant Secretary*

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THE Administrative Assistant Secretary is the chief administrative officer of the Department, responsible to the Secretary for the direction of the administrative management functions. These include broadly those activities necessary to accomplish the authorization, financing, staffing and management of all departmental programs and the integrated direction of these functions for the Department. He also serves as advisor to the Secretary and other departmental officials on program and policy matters particularly with respect to the interrelations of administrative management considerations and program and policy questions. The Administrative Assistant Secretary is responsible for developing policies and standards, planning and evaluating programs, and reviewing performance in all matters concerning administrative management. The Administrative Assistant Secretary is the principal representative of the Department in transactions with the Bureau of the Budget, the General Services Administration, the Civil Service Commission and the General Accounting Office. He also acts as the Department's representative before Congressional, interdepartmental, and public groups on administrative management matters. The Administrative Assistant Secretary directs and supervises the work of the following staff divisions comprising the Office of the Administrative Assistant Secretary:

Division of Administrative Services

Floyd E. Dotson, *Director*

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The Division of Administrative Services develops and directs the application of policies and procedures with respect to administrative services throughout the Department and supplies the internal operating and housekeeping services required by the Office of the Secretary. The Division also provides other Departmental units with centralized library, museum, employee health, space, telephone, photographic, warehousing and shipping, duplicating, and printing and binding services.

Branch of Library Services.—The use of Central Library facilities continues to grow with significant increases in circulation of books and periodicals, and in use of the reading room. Statistics for the previous year are: patrons of reading room, 35,051; incoming telephone calls, 17,435; circulation of books and periodicals, 62,301; interlibrary loans, 7,236; research and historical queries, 17,013; acquisitions, 18,409 books and 56,696 periodicals. Total of shelved holdings rose to 422,000.

Branch of Personnel Operations.—The Branch continued to perform normal personnel functions for the Office of the Secretary. During the year the workload of the Branch was increased with the assumption of responsibility for personnel services in connection with the defense activities attached to the Department and with the transfer of all legal and supporting personnel from the bureaus to the Office of the Secretary.

Fiscal Section.—This Section provided the regular budgeting and accounting services for the Office of the Secretary and also for the Defense Minerals Exploration Administration, Defense Solid Fuels Administration, Board on Geographic Names, and for the working capital fund. The section also handled the control, budgeting, and reporting work on the approximately $4,000,000 in funds transferred from other agencies for use by the various bureaus of this Department. Expenditures by the Office of the Secretary during the year were about $4,000,000, and operations under the working capital fund were approximately $1,155,000.

Records Management and Space.—A new standard filing system was developed and installed in the Central Files Section. As part of the records disposal operations 500 cubic feet of obsolete records were destroyed, and 300 cubic feet of inactive records were transferred to Federal records centers for storage. This represents a savings of 135 file cases, with an approximate replacement cost of $6,000. The mail and files operations in the Office of Territories were surveyed in cooperation with the Division of Management Research, and improved techniques and operating patterns were recommended. All employee personnel folders were rearranged to agree with revised standards of the Civil Service Commission.

The Department gained 1,100 square feet of floor space in the Interior Building and released 6,600 square feet of rented space in the metropolitan Washington area. The net reduction of 5,500 square feet resulted from the cutback of defense agencies affiliated with the

Department. Space gained within the Interior Building was utilized to realign offices and personnel for greater efficiency and economy.

Museum.—The Interior Department Museum maintains extensive collections of educational and scientific models, specimens, artifacts, and special exhibits which illustrate the Department's history, aims and activities. During the year 31 exhibits were brought up to date, and 12 special exhibits were prepared and shown. Some 43,000 persons signed the visitors' register, an additional 23,000 viewed the educational motion pictures which are shown daily and more than 100 special school and college groups visited the Museum.

Branch of Central Services.—This Branch is responsible for the operational management of centralized duplicating, communications, employee health, photographics, warehousing and shipping, and printing and binding services for the Department, and for procurement work for the Office of the Secretary.

Division of Budget and Finance

Sidney D. Larson, *Director*

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The Division of Budget and Finance is responsible for the staff supervision of the budget, financial and investigative activities of the Department. It represents the Department in liaison with other Federal agencies and appropriation committees of the Congress. The Division consists of the Office of the Director and three branches to carry out assigned functions.

Appropriations to the Department for the fiscal year ending June 30, 1954 total $439,283,050. Receipts for this period are estimated to be in excess of $265,000,000.

The Division provided staff assistance in management surveys of the legal and information functions of the Department. During the year periodic reviews were made of budgetary programs to insure that programs were being executed in accordance with the purpose for which appropriated and that economies were being made where possible without adverse effect to approved programs.

Initial steps were taken to develop program schedules for the support and justification of construction estimates of the Bureau of Indian Affairs, National Park Service, and the Alaska Road Commission. Studies were continued on the advisability of the business-type budget for several of the bureaus of the Department.

The Division participated in the joint program of the Bureau of the Budget, Treasury Department, and General Accounting Office for improving accounting and fiscal reporting. Accounting surveys were instituted for National Park Service and Geological Survey with the objective of improving accounting procedures and financial reporting. Continuing assistance was provided other bureaus of the Department in accounting systems improvements and other fiscal matters. Accounting manuals were prepared and approved by the Comptroller General for the Bureau of Mines, the Office of the Governor of Alaska, and the Trust Territory of the Pacific Islands.

The Division cooperated with the General Accounting Office and with the bureaus of the Department with respect to the comprehensive audit program and provided the leadership for correcting deficiencies in fiscal and other matters brought out in the audit reports. All bureaus and offices of the Department have been placed under comprehensive audit by the General Accounting Office.

The Division conducts investigations into alleged irregularities in the performance of official duties by employees of the Department and of other matters within the responsibility of the Department. In instances where violation of criminal statutes are indicated cases are referred to the Attorney General for appropriate action. The case load for the fiscal year is as follows:

Assigned	39
Reported	34
Disposed	19
Pending	29

Division of Management Research

Arthur B. Jebens, *Director*

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The Department's objective of reducing appropriation requirements and expenditures without disrupting or impairing essential programs has given renewed vitality to the continuous search for more efficient and effective processes for conducting Departmental programs. The Division of Management Research provides facilities for coordinating efforts throughout the Department towards the achievement of this goal.

During 1953 the Division provided assistance to the Secretary's survey teams which reviewed the major operational activities of the Department. The Division's role was twofold in that it provided personnel, as representatives of the Administrative Assistant Secretary, to participate as team members or consultants to the survey teams on administrative management matters, and also supplied the survey teams with basic source materials concerning the administrative processes under review. Subsequent to the completion of these surveys, the Division continued to provide assistance to the bureaus in the implementation of recommended improvements to assure conformance to secretarial intent and to supply leadership in the work of task groups or committees necessary to implement survey recommendations. Examples are the task groups established to study the feasibility of greater uniformity in format and other mechanics of manual preparation which were recommended in the Secretary's survey report on bureau manuals and related materials.

The Division carried on its regularly assigned functions with respect to continuing problems of organization and administrative procedures. Administrative changes necessitated by the surveys required additional assistance to the bureaus in the preparation of organization handbook changes, revisions of orders, amendments to regulations, preparation or review of legislative reports and similar matters in which the Division could offer significant help.

Attention is also directed to those projects which reflect a cross section of the Division's activities in special areas. The Division: (1) Made a preliminary study and arranged for the consolidation of the administrative services of all bureaus of the Department in Portland, Oreg.; (2) coordinated the preparation with other divisions of a special report to the Bureau of the Budget concerning a proposed reorganization affecting the functions of the Bureau of Land Management; (3) participated in and guided a committee study of machine tabulation equipment; (4) prepared detailed plans for use by the Department in performing minerals mobilization responsibility under delegation from the Office of Defense Mobilization; (5) assisted in effecting the termination of the Petroleum Administration for Defense and the Defense Solid Fuels Administration and distributing their residual functions to permanent organization units; (6) coordinated the preparation of special reports to the Senate Committee on Government Organization, the Senate Appropriations Committee and the President's Advisory Committee on Governmental Operations; (7) provided leadership and staff guidance for the Board on Manuals and Publications which was established to perform certain functions recommended in the Report on the Department's Information Program and the Review of Bureau Manuals; (8) made a special study of the audit functions of the National Park Service.

The management improvement program continues as the yardstick by which departmental expenditures and operations are reviewed to determine if the greatest returns from program investments are being realized. Additionally, the annual comprehensive Management Improvement Report serves as one device for monitoring the progress of bureaus in the implementation of the recommendations of the survey teams.

The Department's incentive awards program was responsible for substantial monetary savings through employee efforts to increase the efficiency of their operations and cut costs. There were also intangible benefits that occurred from improved working conditions, improved safety factors and better service to the public. A summary of the Department's incentive awards activities for the 1954 fiscal year is as follows:

Number of suggestions received	1, 104
Number of suggestions awarded	414
Amount of cash awarded	$17, 788
Annual savings	$353, 551
Superior accomplishment awards	162
Leading to savings	10
Amount of savings	$3, 654, 495
Efficiency awards approved	9
Annual savings	$119, 202
Honor awards granted:	
Distinguished service	48
Meritorious service	94
Commendable service	371

Division of Personnel Management

Guy W. Numbers, *Director*

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During 1953 the Division of Personnel Management gave particular emphasis to the streamlining and improvement of bureau methods of personnel administration to complement the organization surveys made of Departmental operations. The Division's guidance was reflected in regularly scheduled meetings with bureau personnel officials and in directing attention to problem areas that required special review. The Division analyzed the implications of these reorganizations upon such areas as the placement of career employees affected by reductions in force, reassignments or transfers necessitated by organizational changes, and the establishment of excepted positions designated as confidential or policy determining.

In the field of position classification and wage administration, particular emphasis was given to the consideration of matters related to the classification of top-level positions, liquidation of defense agencies, post audits, preparation of new position standards, territorial differentials, proposed changes in the Classification Act of 1949, and the renegotiations of amendments to existing labor-management agreements.

In the field of employment, activities included the preparation of qualification standards for positions peculiar to the Department; development of examination and test material for park ranger, park police, and motor vehicle operator positions; improvements in procedures for recruiting, transferring, and promoting employees; and the rendering of reports on compliance with Whitten Amendment provisions.

Eight junior management assistants and 15 departmental employees successfully completed the fifth departmental management training program which is designed to develop the management background of young career employees who have the potential for administrative leadership. Efforts were made to induce more effective training through line operations.

The Division continued its study of personnel issuances. In collaboration with the Board on Manuals and Publications, established by the Secretary in April 1954, the Division has been working toward the development of Departmentwide manual plans in the area of personnel administration.

A staffing standards study was initiated during the year to provide a work measurement plan to measure the ratios of personnel workers to total employees. It is anticipated that this study will assist in providing staffing guides for the Department consistent with ratios established by Congress and the Bureau of the Budget. A 10-week pilot operation of the plan in the Bureau of Mines, the Fish and Wildlife Service, and the National Park Service indicates that it may be feasible to establish such guides on a Departmentwide basis.

Seventy-five Civil Service regional inspection reports were analyzed during the year and served as an aid in the evaluation and improvement of bureau personnel operations.

Special reports were supplied to the Task Force on Personnel of the Commission on Organization of the Executive Branch and to the House Committee on Post Office and Civil Service on the leave system, the performance rating system, and supervisory development programs.

At the close of the fiscal year there were 56,831 compensated employees in the Department, a reduction of 1,896 from the previous year. Approximately 1,400 were separated by reduction in force. There were 5,486 persons employed in Washington, D. C. During the year 391 employees of the Department retired.

Division of Property Management

N. O. Wood, Jr., *Director*

☆ ☆ ☆

The Division continued its program of staff supervision of the Department's property management programs and gave particular attention to the solution of problems connected with improved methods of procurement, and increases in utilization of Federally owned real and personal property under the jurisdiction of the Department.

Members of the staff continued to serve on and to participate in the activities of several interdepartmental boards and committees working toward improvement of the Federal Supply System through simplified procurement and contracting practices, more accurate determination of needs, and by development of item descriptions and standards. Assignments undertaken or completed during the year included a study of needs which could be met by the Federal Prison Industries establishments, and a review of the use of electric typewriters within the bureaus of the Department.

The Division developed standards and procedures for promoting the exchange and transfer of temporarily idle equipment between projects and bureaus, and the transfer between the Department and other agencies of common-use items appearing in excess reports.

In cooperation with other interested departments and with equipment manufacturers, agenda and itineraries were arranged for a number of symposiums on motor vehicle management and care in various cities over the United States and in Alaska. It is expected that substantial benefits will accrue from these meetings in efficiency and economy. Existing regulations concerning use of passenger vehicles on official business were extended to cover all other types of motor vehicles.

In discharging its responsibility for real property in its care, the Department undertook the task of inventorying all real estate holdings other than the public domain, and improving the official records relating to each parcel of real property. During 1954, negotiations were successfully conducted with General Services Administration to transfer to the Department a number of parcels of entrusted real property now in use as parks or for recreational purposes, and action was completed on the transfer of Angel Island in San Francisco Bay to the Department of Defense for military use.

Cooperation of the Division was extended to various task groups and representatives of other agencies studying the methods and results of operations conducted by the Department. Among the practices reviewed were those of commercial-type activities, real property controls, inventory practices, and traffic management.

In the accomplishment of its records management function, a revised and simplified Correspondence Handbook was developed and issued; its more simple format and more effective distribution are expected to achieve significant gains in efficiency. Records Control Schedules providing for more uniform and prompt disposition of inactive records were developed and put into use in all but two bureaus. Transfers of inactive records to Federal Records Centers continued satisfactorily.

During the year, 243 radio-frequency assignments, authorized by or coordinated with the Interdepartment Radio Advisory Committee, were issued by the Department to provide for the radio-communication requirements of the various offices and bureaus of the Department. A total of 369 notifications of frequency assignment were sent to the International Telecommunication Union for the registration of Interior radio stations. The departmental basic plan for project CONELRAD (control of electromagnetic radiation) was prepared, approved, and promulgated.

Division of Security

J. Cordell Moore, *Director*

☆ ☆ ☆

In the first full fiscal year of its operation the Division of Security assumed responsibility for setting in motion a completely new security program. During the year regulations were issued with respect to personnel security, as set forth in Executive Order 10450; and physical security, in accordance with requirements of Executive Order 10501.

A large number of positions were declared sensitive under the above program and, at the end of the fiscal year, over 95 percent of the investigations had been completed and clearances issued. The readjudication of certain types of cases, in accordance with newly issued personnel security regulations, were approximately 85 percent completed by the year's end. Closer control has also been established over classified material in the Department.

In the field of physical security and Civil Defense the Division has made notable progress in preparing the Department for any emergency which may arise. With the end of the fiscal year, the Division began a second phase of the overall security program, with particular emphasis on establishing an improved system of security records, and safeguarding information affecting the national security.

Office of the Solicitor

Clarence A. Davis, *Solicitor*

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IT is believed that this year represents a great step forward in the administration of the legal affairs of the Department. A complete reorganization has been made effective.

For many years each of the various bureaus of the Department have had a separate legal staff with a chief counsel and subordinates, all of whom were responsible primarily to the heads of the bureaus as administrative officials, and none of whom was administratively responsible to the Solicitor, despite the fact that the Solicitor has been designated by law as counsel to the Secretary and head of the legal department. The result has been for many years a lack of coordination of the work of the bureaus, conflict of legal opinions between various bureaus, and a lack of authority in the Solicitor over the administration of the legal affairs of the Department, despite the responsibility imposed upon him by law.

This situation has been the subject of criticism by various Solicitors of the Department for many years.

This administration caused a complete survey of the legal affairs of the Department to be made by a survey team headed by counsel thoroughly familiar with the handling of nationwide legal affairs. That survey team recommended that all the legal work of the Department stem from the Solicitor's Office, and that all bureaus and agencies of the Department rely upon the Solicitor's Office for legal advice.

The matter was presented to the Houses of Congress, who accepted the plan, and as a result transferred to the Solicitor's Office all appropriations for legal services previously made to the various bureaus. Following this action all attorneys in the Department were transferred to the payroll of the Solicitor, and a vertical line of authority established from the Solicitor through a deputy solicitor through six associate solicitors, designated as follows: (1) Public Lands, (2) Mineral Resources, (3) Territories, Wildlife, and Parks, (4) Indians, (5) Reclamation and Power, (6) Appeals.

Important legal matters arising in the various bureaus of the Department will clear through associate solicitors, and by the establishment of close contact between the various associates it is felt that uniformity of opinion will be achieved and that the legal staff will be free to express legal opinions without administrative domination. This action further restores the lawyers of the Department to an independent status as professional people, was cordially welcomed by most of the lawyers of the Department, and resulted almost immediately in a more free exchange of ideas and a great improvement in morale. It further negatives over-specialization and makes possible a more friendly interchange of work load. All of the lawyers of the Department in Washington are now housed in units of the Solicitor's Office rather than isolated in particular bureaus as heretofore.

The same principle will be carried into the field, with the establishment of regional solicitors in some 5 or 6 areas, with all lawyers in that area, regardless of their assignment respecting the work of the bureaus, responsible to the regional solicitor and not to administrative agencies.

A survey of the more important matters handled in the Solicitor's Office during the year follows:

CONTRACT APPEALS

At the beginning of the fiscal year, 33 contract appeals were pending. During the year, final action was taken on 28 appeals, and 45 cases were pending at the end of the year. Initial steps were taken in the preparation of rules of procedure to govern contract appeals in the Department.

Among the more important matters in this category were the following:

Boespflug-Kiewit-Morrison, CA–175 (August 21, 1953). When the terms of a change order have not been followed, so that the payment of the stated lump sum for the work specified in the order, based on unit prices listed therein, would result in an overpayment to the contractor for the work actually performed by it, an appraisal of the entire work under the change order should be made and a new change order issued which will make an equitable adjustment for the type and amount of work actually done.

Bury Compressor Company, CA–189 (October 19, 1953) and *Timber Structures, Inc.*, CA–200 (October 14, 1953). Under the "Delays-Damages" clause in the specifications of a standard Government supply contract, delays in transit of supplies ordered by the contractors were in the particular circumstances a ground for an extension of time to perform the work covered by the contracts.

John L. Herrmann & Associates, Inc., CA–194 (July 13, 1953) and *Mac Exploration Company*, CA–202 (December 16, 1953). These two appeals resulted from a notice of termination of Government contracts by the contracting officers. In the *Herrmann* appeal the action of the contracting officer in terminating a contract for the production of a documentary film of the shrimp fishing industry was upheld primarily because the film did not meet adequate standards and its completion had been delayed far beyond the date fixed in the contract. In the *Mac Exploration Company* appeal, the notice of termination in a core drilling contract was not sustained when the breach of contract was partial and immaterial, and the contracting officer had erroneously required the contractor, at the risk of having the contract terminated, to recondition the hole by a specified date.

CLAIMS

At the beginning of the fiscal year, 43 tort and irrigation claims were pending. During the year, a total of 100 claims involving damage to property or personal injury were decided. In addition, final action was taken on 21 appeals from determinations of field attorneys. At the end of the year, 37 claims were pending. Among the more important determinations of tort claims were the following:

Emard Packing Company, T–545 (August 25, 1953). When a train car of The Alaska Railroad ran off a spur track belonging to the railroad and damaged a private dock, the doctrine of *res ipsa loquitur* applied.

Guy P. Kearns, T–548 (October 21, 1953). A trespasser cannot recover for damage to personal property that results from the defective condition of a crane of which the Government operator was unaware.

Leroy Gienger, T–549 (Revised) (April 20, 1954). The Government is liable in tort under the law of a State imposing absolute liability for damage caused by blasting.

Among the more important determinations of irrigation claims were the following:

County of Natrona, Wyoming, T–512 (Ir.) (December 30, 1953), granting relief for damage to a public highway bridge due to extraordinary use in the construction of an irrigation project.

Mrs. Bertha Theobald, T–569 (Ir.) (June 30, 1954), making an award for property damage resulting from seepage through the pervious banks of a natural stream utilized for irrigation purposes in conformity with State law, without alteration of the existing channel or in excess of its established maximum capacity.

Chicago, Burlington & Quincy Railroad Company, T–599 (Ir.) (June 23, 1954), making an award for the cost of repairs required to assure the safety of a railroad bridge, in view of the contractual obligation of the Government to take precautions to prevent damage.

INDIAN AFFAIRS

Three appeals were pending at the beginning of the fiscal year. During the year, 22 appeals were decided, and 13 were pending at the close of the year. The following opinions indicate some of the more important matters handled during this period:

M–36175 (July 30, 1953). Indian allotted and tribal lands may not, under existing law, be included, with or without the consent of the Indians, in State irrigation districts which would have the power to operate and maintain the Indian projects serving such lands, and to assess such lands for irrigation charges, even under contracts which would not permit the irrigation districts to resort to foreclosure proceedings in State courts to enforce the collection of such charges.

M–36164 (September 10, 1953). Since the law of the State of Arizona regulating the withdrawal of ground water cannot be applied to Indians on Indian reservations in the absence of congressional legislation specifically making such law applicable, the State law may not be extended to Indian reservations by agreement of the Department, Bureau of Indian Affairs, and Indian tribal councils.

M–36197 (December 31, 1953). The Congress may terminate Federal supervision and control over Indian property. Such termination would ordinarily carry with it the subjection of the property to State taxation even without a declaration to that effect by the terminating legislation. However, Indians allotted under the General Allotment Act, either on their reservations or on the public domain, in the context of a treaty scheme or agreement, express or implied, enjoy vested rights to the exemption of their lands from taxation not only during the original trust period but also during extensions of such trust period, and such rights may not constitutionally be terminated by the Congress.

M–36148 (February 3, 1954). The Secretary of the Interior may acquire by condemnation lands on the Crow Indian Reservation in Montana needed for a reclamation project.

M–36184 (February 15, 1954). The Secretary of the Interior may not issue patents in fee to individual Indians unless the allottees or their heirs have applied for them. The Secretary's authority is discretionary so that he might legitimately take into account factors other than competency of the Indian in determining whether a patent in fee should issue. Where an Indian to whom a trust patent has been issued under the General Allotment Act receives a patent in fee for the whole of his allotment, he becomes subject to the laws, both civil and criminal, of the State of his residence.

M–36200 (February 12, 1954). The lands of the Colorado River Indian Reservation are held in trust by the United States for the benefit of the members of all tribes of the Colorado River and its tributaries who have been or who may be located thereon under Federal authority. An ordinance of the Colorado River Indian Tribal Council, which permitted the settlement on the reservation of Navajo and Hopi Indians, constituted a valid and enforceable agreement on the part of the United States Government.

PATENTS

Early in the fiscal year, the Department of Justice discontinued its practice of prosecuting patent applications on behalf of the Department of the Interior on a regular basis, and returned all cases upon which patent applications had not been filed. The responsibility for the prosecution of applications, accordingly, has devolved upon this office. In addition to this work, six opinions relating to employee rights in inventions were prepared.

PUBLIC LANDS

Three hundred thirty-one appeals in public-land matters were pending at the beginning of the fiscal year. During the year, 338 appeals were decided, and 214 were pending at the close of the year. Among the more important decisions on appeals were the following:

Emmet F. Spencer et al., A–26620 (August 13, 1953). A petition for the approval of an assignment of a potash permit, which reserves or creates overriding royalty obligations, should not be approved unless, on the basis set forth in 43 CFR 194.27a, they are subject to reduction to not less than a total of one percent of the gross value of the output at the point of shipment to market whenever, in the interest of conservation, it appears necessary to do so in order to obtain the greatest ultimate recovery.

Martin J. Plutt, Ellen E. Hosley, A–26723 (August 17, 1953). Where the owner of land contiguous to an isolated tract of public land offered for sale properly asserts a preference right to purchase the land, and then disposes of the contiguous land after the close of the period allowed for the assertion of preference-right claims and before he receives a cash certificate or patent for the isolated tract, he does not thereby lose his preference right to buy the isolated tract.

Emery E. and Beulah M. Arbaney et al., A–26942 (December 16, 1953). When any evidence appears in a proceeding for a public sale under 43 U. S. C., sec. 1171, as amended, which indicates that prior to the sale the interested parties, or some of them, may have arrived at or attempted to arrive at an agreement not to bid against each other, doubt is cast upon the validity of the proceedings and it is necessary to vacate the sale.

Takako Fujimura, A–26798 (December 18, 1953). Where the Department has held that a noncompetitive oil and gas lease, which is later canceled, was fraudulently obtained, an application for the repayment of the advance rental must be denied. The fraudulent acts of the lessee's agent acting within the scope of his employment, whereby an oil and gas lease is fraudulently obtained, are chargeable to the lessee, whether or not he knew of the fraudulent acts.

Sam D. Rawson, A–26800 (December 18, 1953). A material site permit which was regularly issued under the Federal Highway Act to a State agency precludes the subsequent location of a placer mining claim on the same land. Where a highway being built under that act is approximately 2 miles distant from the public land covered by the permit, a determination that the land is "adjacent" to the road within the meaning of section 17 of the act is not unreasonable.

Arthur L. Wingard et al., A–26977 (June 3, 1954). Where land is classified, pursuant to a State's application to select land for internal improvement, as suitable for disposition as a State selection and is later classified as suitable for disposition as small tracts, the preference right given the State by section 7 of the Taylor Grazing Act prevails over the preference given by the Veterans' Preference Act to veterans who file small-tract applications after the State's application and after the small-tract classification.

Herbert R. Lewis, *Charlotte L. Murphey*, A–26819 (June 30, 1954). In the absence of an appeal to the Secretary of the Interior the Director of the Bureau of Land Management may, on his own motion, reconsider a decision previously rendered by him and correct any errors which may have been made in the former decision. When an appeal is taken to the Secretary from a decision of the Director of the Bureau of Land Management, the Director loses his jurisdiction in the matter and may not, thereafter, in the absence of authority from the Secretary, render a supplemental decision in the matter.

Solicitor's opinion M–36187 (November 12, 1953) held that to qualify to buy a 5-acre tract in Alaska as a home or headquarters site under the first proviso of section 10 of the act of May 14, 1898, as amended, the claimant must be engaged in trade, manufacture, or other productive industry but need not carry on his trade or other occupation on the tract. In M–36178 (January 5, 1954, as supplemented March 4, 1954) the view was expressed that an application made by a State to exchange lands outside of a grazing district pursuant to section 8 (c) of the Taylor Grazing Act, as amended, is not subject to the classification authority of the Secretary of the Interior under section 7 of the act and that a State exchange application may not be rejected merely because the lands selected may have been classified pursuant to section 7 as being suitable for disposition under another of the public-land laws.

The office participated in the preparation of regulations, which were issued during the fiscal year, under the Outer Continental Shelf Lands Act. This act deals with the natural resources in submerged lands lying outside the boundaries of the States.

GENERAL

As in the past, the office was called upon to review, or to give opinions upon, many matters arising out of the operations of the various bureaus or relating to the general administration of the Department. Twenty cases involving investigations of alleged misconduct on the part of employees of the Department were reviewed, and a member of the office served as departmental legal security officer. Legal work required in connection with the responsibilities of the Secretary of the Interior relating to the Defense Production Act of 1950, industrial mobilization, and post attack rehabilitation was performed by the office, which also handled the legal work connected with the saline water program. Legal assistance was provided in connection with the sale to private interests by the Virgin Islands Corporation of the Bluebeard's Castle Hotel.

LEGISLATION

The fiscal year 1954 included the final portion of the first session of the 83d Congress and the initial portion of the second session. The following statutes of major importance to the Department of the Interior were enacted during the fiscal year:

> Public Law 159 (67 Stat. 227) liberalizes the Color of Title Act, a statute under which persons who have occupied public lands during a long period of years, in reliance upon a purported claim of title, can obtain ownership of the lands they have so occupied.
>
> Public Law 212 (67 Stat. 462), the Outer Continental Shelf Lands Act, establishes a comprehensive system of law to govern the exploration, development, and utilization of the natural resources on or within the submerged lands of the Continental Shelf outside the boundaries of any of the States.
>
> Public Law 230 (67 Stat. 495) contains a number of "housekeeping" authorizations designed to facilitate the efficient operation of the National Park System.
>
> Public Law 250 (67 Stat. 539) provides for the validation of a large number of mining locations made under the United States mining laws on lands that were closed to location under those laws either because the lands were subject to outstanding mineral leases or applications for such leases, or because the lands were known to be potentially valuable for oil and gas.

Public Law 258 (67 Stat. 566) modernizes the law governing the exchange of farm units on Federal reclamation projects.

Public Law 277 (67 Stat. 586) repeals entirely the portion of the so-called Indian liquor laws which prohibited the sale of intoxicating liquor to Indians at any place in the United States outside the boundaries of the Indian country and modifies the portion of those laws which prohibits the introduction or possession, or the sale to either Indians or non-Indians, of intoxicating liquor within the boundaries of the Indian country by providing that these restrictions shall not apply to any transactions in intoxicating liquor that are in conformity both with State law and with duly adopted Indian tribal ordinances.

Public Law 280 (67 Stat. 588) declares that the Indians in the States of California, Minnesota, Nebraska, Oregon, and Wisconsin (except the Red Lake Indians in Minnesota, the Warm Springs Indians in Oregon, and the Menominee Indians in Wisconsin) shall be subject to the general criminal and civil jurisdiction of the courts of those States, and that these Indians shall be subject to the criminal laws of the five States, and to such of their civil laws as are of general application to private persons or private property. The act qualifies the authority it confers on the States by clauses protecting Indian rights in trust and restricted Indian property, and preserving a limited measure of self-government in the Indian tribes.

Public Law 340 (68 Stat. 57) liberalizes the statutes relating to the grants of public lands for school purposes by permitting the States to obtain title to school sections that are covered by a mineral lease or an application for a lease, at the time of their survey.

Public Law 387 (68 Stat. 173) establishes general procedures for the disposition, by sale or lease, of public lands that are needed for State or local public purposes to any governmental body or nonprofit organization that is prepared to put these lands to use for an established or definitely proposed public project.

Public Law 390 (68 Stat. 239) makes several important revisions in the Small Tract Act, a statute that permits the sale or lease of public lands, in tracts not exceeding 5 acres, for residence, recreation, or business purposes.

Public Law 399 (68 Stat. 250) is designed to bring about the orderly termination of Federal supervision over the Menominee Indians of Wisconsin.

Public Law 402 (68 Stat. 253) grants to veterans of the Korean conflict the same privileges with respect to homestead and other public land entries as are enjoyed by veterans of World War II.

It also extends the period of time during which veterans are to have a preference in making such entries until September 27, 1959, and requires cultivation of veterans' homesteads.

Public Law 426 (68 Stat. 270) settles a long-standing controversy concerning the legal status of certain O. & C. lands in Oregon and permits the release of impounded funds to certain counties in that State.

Public Law 451 (68 Stat. 330) and Public Law 229 (67 Stat. 494) clarify the authority of the President to establish local executive, legislative, and judicial agencies in the Trust Territory of the Pacific Islands and the authority of the appropriate committees of the Congress to report appropriations for the conduct of necessary governmental activities in the trust territory.

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1955 ANNUAL REPORT

Secretary of the Interior

DOUGLAS McKAY

Partnership in Resource Conservation and Development

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FOR THE FISCAL YEAR ENDED JUNE 30

1955
ANNUAL
REPORT

Secretary of the Interior

DOUGLAS McKAY

PARTNERSHIP IN RESOURCE CONSERVATION AND DEVELOPMENT

DEPARTMENT OF THE INTERIOR
March 3, 1849

FOR THE FISCAL YEAR ENDED JUNE 30

UNITED STATES
DEPARTMENT OF THE INTERIOR
Douglas McKay, *Secretary*

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March 3, 1849

THE SECRETARY OF THE INTERIOR
WASHINGTON

My Dear Mr. President: I transmit herewith the Annual Report of the Department of the Interior for the fiscal year which ended June 30, 1955.

The review of the activities of the Department's bureaus and offices which this report provides indicates the substantial nature of the continued progress which is being made in carrying forward the Department's important missions. The report also furnishes a brief examination of the ways in which partnership in resource conservation and development can serve in meeting successfully the tremendous responsibilities which we face today and must expect in the future.

Sincerely yours,

Douglas McKay

Secretary of the Interior.

The President,
The White House,
Washington, D. C.

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PART I

PARTNERSHIP IN RESOURCE CONSERVATION AND DEVELOPMENT

Partnership in Resource Conservation and Development

☆ ☆ ☆

THE tremendous task of sound resource conservation and development which today confronts the United States must be viewed in the light of the unprecedented economic and technological advances of mid-century America.

Never in world history has a Nation made more sweeping gains in providing a good way of life for its people.

Our economy, expanding at a breath-taking pace, has more than kept up with the gigantic demands of a record growth in our population. Each year as new families form in burgeoning numbers their needs for an amazing abundance of goods and services are being met with the vast outpouring of American industry and the American farm.

What has this meant in terms of our natural resources?

New families and the advance of the American standard of living to a level never before achieved anywhere at any time has created equally record-making demands on all of our resources—our minerals and energy sources, our forests, our land, our water.

New homes mean that the minerals of the earth must be mined to provide the ores that go into the steel, the aluminum, all of the magic metallurgical combinations that we think of simply as homes, automobiles, and washing machines.

To use our washing machines, our television sets, our automobiles, we must have power, and this power comes from the coal, natural gas, and oil that man must take from the supply that nature has built over millions of years. It means also harnessing the best of our sources of water power to make use of the always renewable energy provided by falling water.

Our land, too, faces ever increasing demands for the food we eat, the cotton for the clothes we wear, and the lumber that our forests can provide for a multiplicity of essential uses.

Increasingly also we are recognizing that we cannot take our water supplies for granted as we soberly view the prospect of the growth of our water needs for industrial and domestic use by 145 billion gallons daily—equivalent to the flow of 11 Colorado Rivers—in the next 20 years.

Meeting successfully all of these tremendous and accelerating levies on our natural resources will not be easy. The task is gigantic and complex. It is also vital to the very continuance of our civilization as we know it.

All of those who have realistically faced the problem will agree, however, that it is a task that must be approached by the American people within the framework of their creative traditions. Clearly, this great joint responsibility can best be met by our system of individual enterprise with the Government working constructively to aid and assist but not to dominate and control.

Sound conservation and development of our natural resources demands a realistic partnership of all of the American people. Federal, State, and local agencies charged with resource responsibilities must provide leadership and guidance. But the basic mission must be that of the whole complex of our free society working inventively and productively as only that type of society can.

In essence the partnership policy is simply the realistic carrying forward in terms of our modern problems of that basic truism of the Government's proper relationship to the people that was so effectively stated by Abraham Lincoln: "The function of government is to do for the people what the individual cannot do at all, or do so well for himself, and in all those things which the individual can do for himself, the government ought not to interfere."

The partnership pattern will vary of course, depending on the particular problems to be faced in each resource area and each of the specific situations involved. Inherent in the partnership concept is the clear recognition that the task is not one for Federal agencies, such as the Department of the Interior alone. Nor is it a task for only State and local agencies, or for private initiative alone. Rather, it is a task in which we can best succeed through a program of close teamwork in which Federal agencies, State and local agencies, and free enterprise work together, each performing the function for which it is best fitted.

In the sections of this report which follow, the specific patterns and approaches under which partnership can serve in meeting our resource conservation and development task will be outlined. In each instance, however, we must bear in mind that no magic formula is being promulgated except the enduring American belief in the productivity of our way of life based on a common recognition of our individual rights and responsibilities.

MINERAL AND FUEL RESOURCES

The policy of participation with all interested parties in the better utilization of mineral resources attained new heights in fiscal 1955. The Bureau of Mines and other Department agencies engaged in scores of cooperative projects in the fields of metallic and nonmetallic minerals and mineral fuels.

Cooperation with Industry

Private enterprise has the major responsibility for resource development in the United States. Consequently, service to and cooperation with industry long have been prime objectives of the Department.

These objectives are attained in many ways, since the interests of industry frequently coincide with those of the Federal Government.

For example, the Government must have detailed information on mineral commodities and the industries that produce them so it can plan intelligently for the Nation's military and economic security. The industrialist also needs such information to make the decisions upon which the success of his business depends.

The Bureau of Mines cooperates closely with industry and with other Government agencies, both State and Federal, in collecting and reporting such information. Virtually all of the Bureau's industry-wide statistical canvasses are partnership projects in which forms are submitted to industry for information and returned voluntarily.

At times, industrial associations find Department facilities and impartial viewpoint useful for carrying out special joint canvasses. Such a canvass, to estimate future cement production capacity was undertaken with the Portland Cement Association to provide the President's Advisory Committee with data for planning a national highway program.

New Mining Methods and Machinery

Efforts to develop new mining methods and machinery to utilize mineral resources more effectively supplement those of industry, and whenever feasible are carried out cooperatively.

Bureau engineers and technologists currently are working with the operators of copper mines in three States—Arizona, Michigan, and Nevada—to develop methods of increasing ore recovery and to learn more about such low-cost underground mining methods as block caving. The use of highly sensitive listening devices that pick up subaudible noise resulting from movement in rocks was developed jointly by the Bureau and mining companies to increase safety and conservation when mining underground rock supports, or pillars.

One Bureau-industry project was an investigation of processes to recover beryllium as a coproduct of lithium from an ore mined in North Carolina.

Another dealt with recovery of alumina from high-silica bauxites and residues from commercial alumina operations, and still another developed an improved process for recovering kyanite-sillimanite concentrates from wastes at a mineral processing plant in Florida.

At one of its laboratories, the Bureau created specimens of low-melting synthetic micas for industry to evaluate as bonding agents for grinding wheels.

Cooperation with Steel Industry

For years the Bureau has worked in close partnership with the iron and steel industry. Recent cooperative projects have ranged from research to develop better methods of producing iron, through tests of anthracite as a partial substitute for coke in steelmaking, to studies that developed two processes for recovering manganese from open hearth steel furnace slags.

One of the most closely integrated company-Bureau projects during the year was the development and trial of a mechanical phosphate rock planer similar to certain coal-mining machines. After designing and constructing the first model, Bureau personnel monitored mine tests in which the cooperating company supplied labor, underground transportation, and facilitating services and tools. As a result, the machine has developed from the experimental stage to a point where commercial use seems assured.

Minerals Exploration

Another outstanding example of successful joint industry-Government activity is the Defense Minerals Exploration Administration Program.

To encourage exploration for strategic or critical minerals, Bureau of Mines and Geological Survey engineers worked together under the direction of DMEA to examine and evaluate specific exploration projects for which Government financial assistance is sought. DMEA projects have been undertaken with individuals, partnerships, and companies.

Developing Fuel Resources

Wise development of our reserves of mineral fuels is essential to our continued security. To assure that succeeding generations will have coal and petroleum to meet demands of the future, the Bureau of Mines cooperates with industry and with Federal, State, and local Governments in encouraging conservation of these commodities.

Cooperative programs are underway with bituminous coal and anthracite operators to cut production costs and increase safety through development of improved mining and roof control methods.

In another cooperative effort, the Bureau is working with private firms to devise a means of gasifying coal underground where it occurs in seams too thin or of too low grade to justify conventional mining. Cooperative research on upgrading solid fuels already has resulted in a process for drying lignite to obtain a fuel for power generation and recover tar as a potential source of chemicals.

The Bureau's coal sampling and analysis work not only enable the Federal Government to purchase solid fuels on a guaranteed quality basis, but also aids industry and State and municipal agencies to do the same.

Cooperative research on production, transportation, and storage of petroleum and natural gas and their products is part of the foundation for conservation of these resources. The continuing benefits of this research have been of great value to industry and also to the taxpaying public.

An early example of industry-Bureau research on petroleum was the development of an oil well casing program to protect underground fresh water horizons and prevent waste of petroleum.

This program was adopted and followed by the industry and by State commissions concerned with oil production problems.

The value of the Bureau's petroleum chemistry and refining studies has been recognized by increased financial support from industry and from other Government agencies until today nearly $4 of every $10 spent by the Bureau in this field of research come from outside sources.

The Bureau has cooperated with industry in studies to develop better helium recovery methods and to improve the heating value of certain natural gases. An agreement recently signed with a gas production company enables the Bureau to obtain additional helium-bearing gas for its Navajo Helium Plant from a natural gas that has no value as a fuel.

Oil Shale Research

The Nation's vast reserves of oil shale are an ideal example of a mineral resource that can best be developed by cooperation between Government and private initiative.

The reserves are owned partly by the Government and partly by individuals and corporations. Studies in the experimental mining, retorting, and refining were carried on under an arrangement in which the Department of the Navy permitted use of its oil shale and the Bureau of Mines developed equipment and methods for utilizing it.

Partnership in developing this resource has not been confined to

Government departments, however. Crude shale oil and products from the Bureau's shale oil refinery at Rifle, Colo., were supplied to industry and to other Government agencies for testing and experimentation under 18 cooperative agreements during the past year.

In cooperation with industry, the Bureau last year made more than 2,800 tests of explosives and hazardous chemicals used in mineral production and processing. Conditions leading to gas and dust explosions were studied, as were methods of minimizing explosion damage.

Cooperation With State and Municipal Governments

Much of the Department's work in the fields of mineral economics and health and safety is also of intimate concern to various State agencies, and is best carried out in cooperation with them.

The Bureau of Mines cooperates closely with State agencies in collecting and compiling economic and statistical data on mineral commodities. It has formal cooperative agreements with State geologists or Divisions of Mines in 27 States and Alaska for joint collection of mine production data.

One of the finest examples of State-Federal partnership is the Bureau's Petroleum Experiment Station at Bartlesville, Okla. Since this station, said to be the largest installation of its kind in the world, was established in 1918, the Oklahoma State Government has continuously provided through regular appropriations part of the money for salaries and operating expenses. Technologic developments born of this partnership have benefited not only the petroleum industry and the State of Oklahoma, but also the rest of the Nation.

For many years the Bureau of Mines has worked with State, county and municipal agencies in the business of fighting coal fires on private property. All these agencies have exchanged information freely in controlling fires in abandoned coal mines or in coal beds which are not on the public domain. Moreover, the partnership extends to payment of the cost of fighting these fires. Under present legislation, this cost is borne on a matching dollar-for-dollar basis by the Federal Government and the interested agency, which may be a private coal company, the State, or other political subdivisions.

The Bureau likewise cooperates closely with mining departments of several States in administering the Federal Coal Mine Safety Act and in carrying out its various accident prevention and safety training programs.

Cooperation With Other Federal Agencies

The specialized technical-knowledge and facilities available in the Bureau of Mines are used by many other Government agencies in carrying out their work.

Typical cooperative programs currently in progress with the General Services Administration are aimed at developing domestic resources of selenium, recovering columbium from Arkansas titanium deposits, and increasing output and improving recovery of nickel and other metals from deposits at Nicaro, Cuba.

The Bureau also performs mine examinations, metallurgical tests and quality control tests for GSA. Examples are investigation of an asbestos mine in Venezuela, and analysis and laboratory testing of low-grade manganese ores submitted to GSA depots to determine their acceptability and value.

The Bureau has participated in the work of the Atomic Energy Commission to develop resources of radioactive minerals. More than 20 monazite-bearing placer deposits have been investigated by the Bureau, and at least half of these give promise of becoming commercial producers.

In cooperation with the Atomic Energy Commission and the Navy Department's Bureau of Ships, the Bureau of Mines developed methods and constructed and operated the country's only facilities to produce hafnium-free ductile zirconium needed for research in constructing nuclear power generators. This program developed improved methods of recovering metallic zirconium and hafnium at lower cost than are now used by commercial producers.

In 1955 the Bureau of the Census, Department of Commerce, was authorized by Congress to take a census of the Nation's industries and businesses. To minimize duplication, increase effectiveness, and assure complete coverage, the Bureaus of Census and Mines are cooperating on the census of mineral industries. Many canvasses are being conducted jointly, and the information obtained will be of great value both to the Government and to industry.

Oil and Gas Regulatory Activities

Cooperation between the Department of the Interior and the oil and gas regulatory agencies of the petroleum producing States dates back more than 40 years.

In 1914, the Secretary of the Interior offered the services of Bureau of Mines experts to cooperate with State officials in stopping the waste of natural gas in Oklahoma. The Bureau assisted in drafting two laws on oil and gas conservation which were passed in 1915 by the Oklahoma Legislature.

The 1915 Oklahoma oil law has been a beacon in the history of oil conservation.

During the past two decades, the Department has had active and close cooperation with the States in the enforcement of their conservation laws through the administration of the Connally Act, passed in 1935 to prohibit interstate shipment of oil produced in violation of certain State oil and gas conservation laws and subsequent orders.

Early in 1947 the Secretary of the Interior strengthened cooperation to further oil and gas conservation with the designation of the Director of the Office of Oil and Gas as the Department's official representative to the Interstate Oil Compact Commission.

Since then, the Department has participated regularly in meetings of the Compact Commission, under which member States and Alaska have exercised leadership in improving and standardizing oil and gas conservation practices throughout the country, as well as providing a forum for discussion of conservation and related problems.

PUBLIC LANDS

Partnership arrangements of one kind or another with the Federal Government are the warp and woof of the responsibilities assigned by the Department to the Bureau of Land Management, which exclusively administers some 468 million acres of public domain lands that are almost wholly unappropriated and unreserved.

The Department works with countless individuals, businesses, industries, local agencies, State agencies, Federal agencies, and even foreign nations through transactions ranging from routine land or mineral filings to multi-million dollar undertakings such as those that are developing the resources of the Outer Continental Shelf.

Thousands of such transactions make up the workload of the Bureau, a workload that bespeaks cooperation.

Partnership is reflected in the financial balance sheet and distribution of the Bureau's "earnings." During the nine years since the Bureau of Land Management was formed, receipts have totaled more than $623,000,000. Of this amount more than $192,000,000 was transferred to the Bureau of Reclamation for investment in dams and other projects (usually constructed by private contract) for development of arid regions of the West. More than $169,000,000 was paid to States and counties for schools, roads and other local purposes. Part of the remainder, when appropriated, has been used for improvement of grazing lands, and the balance was deposited in the miscellaneous receipts fund of the Treasury.

During the fiscal year 1955 alone, income from Bureau of Land Management sources amounted to more than $239,000,000 as compared to its appropriation of $11,913,000—representing a ratio of $20 return for every $1 expended.

Highlights of Cooperation

The historic policy of the United States with regard to the unreserved public domain has been to encourage the transfer of public lands into private ownership when such ownership can make more productive use of the land resources.

Since the lands remaining in public ownership under jurisdiction of the Bureau are either reserved or less desirable than in the past, the rate of their transfer to private ownership has been considerably retarded compared to the earlier days of the Nation.

As demands for public lands for various purposes have increased, new laws and regulations were put into effect, substantially stepping up the declining transfer rate during the past year.

Some 20 million acres of vacant, unreserved public lands remain in the Missouri Basin, much in the form of less desirable isolated tracts surrounded by private holdings. In the first of a series of carefully planned public sales, the Bureau put 94 of these tracts totaling more than 12,000 acres on the auction block in South Dakota near the end of the fiscal year, with more to follow. In another systematic disposal program, some 112,000 acres of lands restored from withdrawal in Arkansas were also put up for public auction sale.

Some 225,000 acres of previously unsurveyed school lands were made available to Western States through stepped-up cadastral surveys, and a program of lieu selection was worked out so that the State of Washington could take possession of some 150,000 acres of its statehood grant school lands.

Park, Forest, Refuge Areas Preserved

It must be emphasized that acceleration of the rate of transfer of certain public lands to private ownership does not mean that the Federal Government intends to dispose of all the land in unreserved public domain status, nor even of the major portion.

Careful selection is made of the lands to be listed as available for disposal; equally careful selection is made of lands to be withdrawn from unreserved status.

The yardstick in both instances is the course by which the land in question can best be put to its highest and most beneficial use, for the ultimate public good.

National forests, parks, and wildlife refuges are held inviolate, for example. There have been occasions when land exchanges were arranged, usually to achieve uniformity of a tract which would afford better management. Such exchanges have been effected with States or, in some cases, with private individuals when the Federal Government sought to consolidate public acreages or dispose of isolated tracts.

Multiple Use Legislation

The Department was instrumental in laying the groundwork during the past year for passage of legislation that opened to mining location and development more than 7.2 million acres of public lands long withdrawn for power and water sites, with full protection to the Government if the land should be needed at some future time.

This climaxed two other important enactments by the Congress that were vigorously supported by the Department—Public Laws 585 and 167. These conservation measures provide for fuller utilization of natural resources of the public domain by enabling multiple use of the same tracts of land for all kinds of mineral development and multiple use of the surface resources.

Developing the Outer Continental Shelf

Passage of the Outer Continental Shelf Act of 1953 giving the Department of the Interior jurisdiction over submerged lands in the outer periphery of the Continental United States presented a new challenge to the Department.

Keeping pace with the new technologies which have enabled the petroleum industry to develop oil in deeper and deeper waters of the Gulf of Mexico, the Department successfully mapped 20 million acres of OCS lands off Louisiana and Texas for oil and gas leasing purposes. With the maps, locations of submerged lands can be pinpointed as accurately on dry land by means of their coordinate positions related to fixed monuments on the shore. This enabled the Department to proceed with a new program for unlocking these vast resources—a treasure valued in the billions of dollars.

The oil and gas industry backed their faith in the new program by pouring $142.4 million into the U. S. Treasury in bonus bids and first year rentals for the right to explore just 489,869 acres for oil, gas, sulphur in the outer shelf off Louisiana and Texas. This resulted from two bid "sales" held in October and November 1954. Preparations were completed for a third sale, held on July 12, which boosted acreage leased to 864,236 and the bonus-rental cumulative total past the quarter billion dollar mark.

Meeting Log Shortage Crisis

District forestry offices of the Bureau helped relieve a severe log shortage crisis resulting from a 1954 summer-long strike that threatened to prolong the shutdown of Oregon's lumber mills through the winter.

In response to an emergency appeal from the Governor and orders from Secretary McKay, 70 million board-feet of timber, in addition to regular output, were rushed from points nearest existing access roads to supply the dire need of the plywood and other lumber mills affected by the strike.

Soil and Moisture Conservation

Plans were completed during the past fiscal year for a long range cooperative program of soil and moisture conservation designed to rehabilitate most of the Federal rangelands in the Western States.

Six Interior agencies will spend $250 million in a coordinated program of watershed improvement spread over 20 years, ending in 1975.

In addition to appropriated funds, an estimated 40 percent of the total planned operations will be financed by contributions from range users and other private sources and local government agencies.

Range Management

Partnership, particularly during the past year, has been a veritable touchstone to effective administration of the public land grazing resources under the Taylor Grazing Act of 1934.

Wise control of the Federal grazing lands after decades of unregulated use would have been impossible without the voluntary help and support of locally elected grazing district advisory boards. These groups of public-spirited stockmen have spearheaded the Department's drive to effectuate orderly use of the range and apportion grazing privileges equitably among qualified users as called for in the Taylor Grazing Act.

This cooperation has transcended mere lip service. Cash and deeds have supplemented wise counsel. During the past fiscal year, the range users have contributed nearly half of more than $5,000,000 invested in range conservation and improvement works, not to mention instituting or continuing numerous range improvement practices that have entailed many man-hours of labor and use of private equipment.

Contributions both in money and materials from livestockmen constitute about 40 percent of the total annual investment made in these improvements to the public lands. This has had the effect of sharpening the personal interest of the stockmen. When their personal assets are invested with public dollars in the development of public lands, the result is a greater and more permanent accomplishment.

The planning of conservation and improvement measures on a watershed basis has been virtually completed during the past year. In addition to cooperation with public land users, complete and integrated planning has made it imperative to have harmonious working relationships with other Federal and State agencies having an interest in each watershed. Planning groups, composed of interagency representatives, are employed to assure that all affected interests receive adequate consideration.

Cooperative effort has been most effective in meeting emergencies such as the prolonged drought that plagued the Western range country last year and for several years past. Substantial voluntary reductions in numbers of livestock using the range and rapid development of supplemental water supplies have been accomplished through the cooperation of the range users.

WATER RESOURCES DEVELOPMENT

Greater participation by State governments and local communities, private industries and individual citizens is paving the way for a high level of achievement in water resources development in the 17 Western States and Alaska.

Legislation enacted or pending in Congress at the close of the fiscal year pointed to an even closer partnership in this field of conservation by establishing wider horizons for national economic progress in the years to come.

Cooperation between Government and people in the development of the natural resources in the arid lands of the West has been the traditional policy of the Nation for more than a half-century. It had its beginning in 1902, when President Theodore Roosevelt on June 17 signed the first Federal Reclamation Act establishing a revolving fund of proceeds from the sale of the public lands with which to construct water storage dams and other irrigation works in the West.

Administration of this act and other Federal reclamation laws was vested in the Department of the Interior where it remains today. There has thus been afforded a continuity in technical knowledge, and practical experience in the planning, construction and operation of reclamation projects containing such engineering features as the world's largest and highest dams, water-distributing canals, and hydro-electric power plants.

Reclaiming Arid Lands

As a result of this combination of cooperation and continuity, facilities capable of delivering irrigation water to more than 7 million acres of land have been provided by the Department's Bureau of Reclamation. Individual initiative has resulted in the parallel development of 125,000 family size farms and more than 125,000 suburban units. The area for which water can be supplied from Bureau-constructed works comprises about one-fourth of the total irrigated land area of the western United States.

At the earliest date possible, irrigation facilities are transferred for operation and maintenance by the local water user organizations.

Of the irrigation projects or divisions of projects constructed by the Bureau, 89 percent have been transferred for local operation and maintenance.

Partnership Is Stressed

Fresh concepts of cooperative partnership in the development, planning and financing of water resource conservation programs in the West characterized to a striking degree the administration of the Department during the past year.

In general, this policy anticipates that the Federal Government will provide funds for a part of the cost of features of a multiple-purpose project, such as flood control, navigation, interest on the reclamation investment, and perhaps an advance of some of the cost of the reimbursable features of a multiple purpose project.

The balance of the cost would be provided by local public or private sources. Moreover, if the financing can be placed on a broader base, the responsibility for construction will likewise be distributed among the State, local government and private interests. This encourages local control and ownership of local improvement projects.

Benefits Outlive Repayment

Equally important as the conservation of water resources is the contribution made to the national economic structure by the continuous administration since 1902 of the Federal Reclamation program by the Department of the Interior.

Long after project costs have been repaid fully through the sale of electric energy and operations of repayment contracts, the new wealth created through the Federal investment in the development of its own resources will be reflected in a continuing flow of tax revenues from the project areas and in trade with the rest of the Nation as well.

Developments during the year within the framework of the new partnership and cooperation policy point to increasing opportunities for expansion in the Nation's economic structure under the program.

Take, for instance, the Columbia Basin Project in the State of Washington. Here the largest investor to date has been the United States. As the project develops and private capital is used to develop farms, non-farm businesses, communities, public works, transportation facilities and other activities, the non-Federal investment is expected to greatly overshadow the initial Federal investment in the constructed project features.

Advances for 1955

Other instances of cooperation in the advancement of the Federal Reclamation program during the 1955 fiscal year are:

In Arizona, the second 100,000 kilowatt steam generator at the Arizona Public Service Company's Saguaro steam plant was placed in operation during the year. Through cooperative agreements among the Arizona Power Authority, the Company, and the Bureau of Reclamation, the energy generated in the privately-owned plant is wheeled over the Bureau's transmission system to the Company and the Authority's load centers.

Partnership operation between the Bureau and private and public utilities in the region has enabled the Bureau to fully coordinate its hydro generation with the utilities' steam generation, thereby providing maximum utilization of hydro energy with resultant conservation of natural resources. The Bureau's system has also been utilized to wheel steam-generated energy from Arizona to meet shortages in Nevada.

On the Ventura Project in California, a contract was negotiated with the Ventura River Municipal Water District for advanced planning work for which the district has advanced $720,000.

Increased emphasis was given to cooperative engineering effort with small irrigation districts. There was continued improvement in rehabilitation, reconstruction and betterment of irrigation projects built many years ago under private initiative.

Indicative of this effort were the rehabilitation of irrigation facilities on the Dalton Gardens and Avondale irrigation systems in Idaho; the rehabilitation of the Isleta Diversion Dam and more than 180 miles of drains on the Middle Rio Grande Project in New Mexico; and rehabilitation of the Savage Rapids Dam on the Grants Pass Project in Oregon.

Power Partnership in Northwest

As marketing agent for the power generated at specified Federal dams in the Pacific Northwest, the Bonneville Power Administration plays a vital role in the use and development of the region's water resources, involving a close working relationship among Federal and local agencies, and other utility systems, both privately and publicly-owned.

At the present time BPA markets power from Federal plants with 3.6 million kilowatts capacity, and an additional 2.6 million kw are under construction.

Partners in Power Operations

Basic to BPA's operations is its relations with the agencies that build and operate the dams and power plants.

The Corps of Engineers operates Bonneville, McNary, The Dalles,[1] Chief Joseph,[1] Albeni Falls and The Willamette Valley projects; the Bureau of Reclamation operates Grand Coulee, Hungry Horse and Chandler.

Advances In 1955

BPA engineers work closely with the Corps and Bureau in the day-to-day operation of the projects, and participate with their engineer in system studies to determine the best methods of utilizing the reservoirs and waterflow of the Columbia River.

Through such cooperation the power plants are fully adapted to system conditions and contribute to the most economical construction costs and maintenance of the Federal generation and transmission system. These economies are reflected in the low cost of power to consumers.

Northwest Power Pool

The Pacific Northwest as a region enjoys the lowest power rates in the United States. An important factor is the integration of the Federal system with the other major utilities in the Northwest Power Pool, a notable example of partnership between Federal enterprise and local public and private enterprise.

The Pool stretches over an area of 700,000 square miles and encompasses 17,000 miles of transmission and over 7,000,000 kilowatts of capacity.

The Pool is a voluntary organization, a sort of confederacy of autonomous electrical systems. Each system is self-administered, and Pool operations are conducted within a broad framework of understanding based on established operating principles. Successful operation of the Pool depends on integration of all the hydraulic and electrical facilities in the combined systems.

There are 142 power plants in the Pool, of which 123 are hydro and 19 steam-electric. Coordination of these power plants spread over 700,000 square miles is necessarily complicated. The Pool has developed a system of reservoir regulation to take advantage of the diverse streamflow patterns in order to best serve its loads. This calls for complete interchange of information between the operators of the Federal system and other members of the Pool. All decisions are voluntary and unanimous and are made within the framework of interutility contracts, both Federal and non-Federal.

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[1] Under construction.

The measureable benefits of the Pool may be summarized as follows:

1. It permits the 11 major utility systems to make the most economic use of the energy sources available to the combined systems. The result is a substantial saving in the cost of electricity to consumers.

2. Pool utilities not only obtain energy at lower cost because of economic transfers but also benefit from improved continuity of service.

3. Pool operations permit each utility to save on standby capacity to meet emergencies.

4. The integration of 11 generating and transmission systems adds some 600,000 kilowatts—more than one Bonneville dam—to the Northwest's power capacity without adding extra generators.

Relations with Customers

BPA's relations with its 119 customers—of whom 80 are publicly-owned utilities, 9 privately-owned utilities, 18 industrial plants and 12 Federal agencies, resemble that of a partnership as well as seller and buyer.

Close collaboration with the public and privately-owned utilities—who take over half of BPA's power deliveries—is essential in order to determine loads and the transmission facilities required to meet customer needs. Cooperative studies of load growth and power flows by BPA and its customers serve as a basis for system extensions.

The customers are consulted also in the preparation of proposed construction schedules that are submitted to Congress. At the semi-annual customers' meetings the Administrator discusses with them mutual problems as well as BPA policies and plans.

Power Planning

The major non-Federal utilities, including private companies, municipalities, larger public utility districts and electric cooperatives, are planning additions to their generating systems in order to satisfy the rapidly growing power requirements of the Pacific Northwest.

Currently some 45 new projects are being actively considered by local utilities with a total capacity of almost 8 million kilowatts—in addition to about one million kilowatts under construction or definitely scheduled by non-Federal agencies. BPA is cooperating with these non-Federal utilities in planning the transmission systems from projects under construction or consideration.

Some of the projects, such as Priest Rapids and John Day, are proposed for partnership development, with local utilities financing the power plants and the Federal Government responsible for navigation locks, irrigation facilities and fishways.

An important problem that surrounds nearly all of the proposed non-Federal or partnership projects is the transmission of power to markets.

Generally speaking, the energy produced from these dams must be marketed in more than one load center. Integration with the Bonneville grid and the Northwest Power Pool therefore seems to be vital to their feasibility.

Power Partnership in Southwest

The power marketing program of the Department in the Southwest is conducted by the Southwestern Power Administration.

Because of the characteristics of power supply in the Southwest, the Department through Southwestern Power Administration initiated steps toward cooperation with privately-owned utility systems and with rural electric cooperatives which generate and transmit electric power generated from fuels.

On January 1, 1954, a unique power partnership contract was put into effect in Arkansas. On that day, the Southwestern Power Administration began deliveries of peaking hydroelectric power to the Arkansas Power & Light Company in order to enable that company to supply low-cost electric power to the new aluminum plant of the Reynolds Metals Company, at Arkadelphia, Arkansas. Under this three-party contract, the privately-owned power company and the Federal power system pooled their generating facilities to serve the new electric load.

The recent severe drought in the Southwest greatly reduced the amount of hydroelectric power and energy which had been available to the Southwestern Power Administration for sale and distribution. During fiscal year 1955, contractual and operating arrangements were entered into with privately-owned utilities which permitted all the electric loads in the area to be served without curtailment or interruption.

On June 1, 1955, the Department initiated power deliveries through Southwestern Power Administration for another type of power agreement.

This involved a contract between the Federal Government and the Brazos River Transmission Electric Cooperative, Inc., and between that cooperative and the Texas Power & Light Company. The combination of these two contracts place the Government, the cooperative, and the company in a power partnership.

Under this arrangement, the Government obtains the maximum revenue for the sale of power from the Whitney project; the company obtains the maximum value from the peaking hydroelectric power generated at that project; and the cooperative obtains the low-cost power and energy which it needs for its members.

During the year the Southwestern Power Administration successfully negotiated a contract with the Arkansas Power & Light Company which will become effective as soon as the Blakely Mountain Dam project on the Ouachita River is placed in commercial operation.

Under this contract, the Company receives the peaking power capability of the project subject to its own needs and the availability of water supply and, at a point approximately 150 miles from the project, delivers to the system of the Government the full rated power capacity of the project.

Thus, the company obtains the high value of the peaking hydroelectric capacity and the Government receives power where it is needed to serve other electric loads without incurring the cost of transmission.

This arrangement permits the Company to coordinate the use of water at the Federal project with the downstream Carpenter and Remmel hydroelectric projects which are owned by the Company, and assures the maximum utilization of the water resources of the Ouachita River Basin.

Power Partnership in Southeast

The statutory responsibilities of the Department's Southeastern Power Administration are carried out by means of cooperative contractual arrangements which the agency has or is negotiating with the operators of public and private power systems having transmission and generating facilities.

The scores of preferred agencies located in the Southeast are scattered over wide areas. In order to avoid either excessive restrictions in the number of preferred agencies receiving power or prohibitive construction costs, it has been desirable to seek cooperative arrangements with the operators of transmission systems where excess capacity is available in such systems.

Only through such arrangements can the requirement for widespread use at the lowest possible rates be met.

Since adequate facilities are generally in existence to carry power from the projects to customers, cooperative arrangements permitting the use of such facilities to transmit power from the projects result in the cheapest means of delivering power.

The Federal hydroelectric developments in the Southeast for which Southeastern Power Administration is the marketing agency have operating characteristics such that power produced at these projects is usable by more preferred agencies only if it can be supplemented by fuel-generated energy during certain hours of the day when the hydroelectric plants are not operated in order to conserve water.

There presently exists contractual arrangements between the Department of the Interior, acting through Southeastern, and the Tennessee Valley Authority, the Virginia Electric and Power Company, a privately-owned company, and the South Carolina Public Service Authority and Greenwood County Electric Power Commission, both agencies of the State of South Carolina, whereby their transmission facilities are utilized in transmitting power from Federal projects to preferred agencies and the operation of the Federal hydroelectric projects is integrated with the operation of fuel-generating facilities thus making power available on a usable basis to preferred agencies.

Desalting Saline Water

Our rapidly increasing industrial and agricultural production coupled with an ever-expanding population over the past quarter of a century has brought about a tremendous increase in consumption of our water resources. In some areas serious water shortages exist at the present time which emphasizes the fact that our water resources are gradually being overburdened, exhausted, contaminated, or both.

The Department is continuing a research program aimed at developing economically feasible processes for converting saline water to fresh water suitable for municipal, industrial, agricultural and other uses. The program is directed equally to the reclamation of inland saline waters and conversion of ocean water. Attainment of this goal would go far in conserving and increasing the water resources of the Nation.

This activity is primarily a cooperative endeavor with private groups.

The Department carries out the program by: (1) Stimulating the interest of private and public organizations and individuals in the problem and encouraging research and development by correlating and coordinating activities in this field, and (2) conducting scientific research and development by means of federally financed grants and contracts and by a limited amount of research in Federal scientific organizations.

Not only is cooperation and coordination of saline water research activities carried out with private groups, such as State education and research foundations, private research institutes, and industrial institutions, but also with the various other governmental agencies in which there is an interest in the problem.

Such agencies include the Department of Defense, Atomic Energy Commission, Civil Defense Administration, National Science Foundation, Smithsonian Institution, Department of Agriculture, Department of Commerce, Department of State and the International Cooperative Administration.

Progress is being made in the development of practical processes for converting large quantities of saline water to fresh water. However, lowering of process cost to an acceptable level is a very difficult problem to be solved. The results obtained so far are sufficiently promising to indicate that with sufficient time economically feasible processes for the demineralization of both brackish waters and sea water are likely.

Progress in cooperation and encouragement of private groups in the development activities is exemplified by a number of research contracts now in effect, and in the promising results being obtained.

For example, in cooperation with one company a new method of distillation which is particularly applicable to sea water conversion has been developed and is now ready for testing under field conditions. Another industrial firm has received contracts for the design, construction and testing of progressively larger electric membrane demineralization units which appear promising for brackish water conversion. Field testing of the membrane type of equipment is now in progress and is carried out in cooperation with State, local and private organizations.

As another specific example, the solar distillation process is being investigated by three different contractors. These investigations have resulted in a comprehensive evaluation of all work in this field, new designs for solar stills and the development of cheaper materials of construction. Both the Department and these contractors are cooperating in supplying technical papers and exhibits for an international symposium on Applied Solar Energy.

INDIAN AFFAIRS

Indian lands and associated resources, unlike most other lands and resources with which the Department is directly concerned, are the property not of the Federal Government but of individual Indians and Indian tribal groups. The Federal Government's basic role in connection with these resources, which is exercised by the Department's Bureau of Indian Affairs, is that of a trustee holding title to the lands for the use and benefit of the Indian owners.

In the fiscal year 1955, the principle of partnership in the management, conservation, and development of Indian lands and their associated resources was broadened and strengthened on several fronts.

The Bureau's encouragement of Indian participation in such matters has been producing positive results. Several tribes realizing the importance of their land and other resources as the principal source of tribal income, have not only been taking an active part in the management of these resources but also have contributed substantial amounts of tribal funds towards their protection, development and improvement.

Cooperation on Indian Health Problems

Cooperation between the Bureau of Indian Affairs and the United States Public Health Service in dealing with Indian health problems has been going on for many years. In fact, the Public Health Service has played an active part in the attack on these problems not only by providing technical advice and assistance but also by assigning physicians and other personnel in its commissioned corps for terms of duty at Indian hospitals and other field installations.

In recent years, the Indian Bureau has been obtaining a major share of its professional medical personnel by assignment from the Public Health Service. On July 1, 1955, this process reached its logical culmination when the Public Health Service took over full responsibility for the Indian health program under the provisions of Public Law 568 of the 83d Congress.

Despite this shift in basic responsibility, however, it is fully anticipated that the excellent cooperative relationships which have been developed between the two agencies over the years will be maintained and strengthened.

Advances in Indian Education

Cooperative action has been of major importance in the education of Indian children.

Since enactment of the Johnson-O'Malley Act in the mid-1930's, the Bureau of Indian Affairs has been contracting annually with State Departments of Education and local school districts for education of Indian children in public schools. In fiscal year 1955, such contracts were negotiated in 20 States and the Territory of Alaska, providing school opportunities for about 36,000 Indian or native children.

In addition to this perennial cooperation with State and local school authorities, collaboration of a much more extensive nature took place during the year under the Navajo Emergency Education Program.

To achieve the ambitious first-year goal of the program—provision of educational opportunities for an additional 7,000 Navajo children—the Bureau of Indian Affairs solicited and received cooperation from the public schools in the area, from a wide range of community organizations and agencies in the surrounding towns, and from the Navajo tribe itself. Congress provided the funds, necessary to the Department's effort.

As a result, the first-year goal not only was achieved, but exceeded. Total enrollment of Navajo youngsters in schools of all sorts increased from 16,215 at the close of the fiscal year 1954, to 23,679 at the end of fiscal 1955.

Mere statement of the statistics cannot completely tell the story. There is a warm, human element to it which sets of figures standing alone cannot convey. Social progress for a large group is involved, as well as laying the groundwork for good citizens of tomorrow.

In June of 1953, there were about 28,000 Navajo children in the normal school age bracket of 6 to 18. Of this number, almost exactly half were enrolled in schools both on and off the Reservation.

The other half, including many youngsters 15 or 16 years old, never had seen the inside of a classroom. They were growing up totally illiterate.

This startling circumstance called for swift and sweeping action by the Department.

With excellent cooperation from Congress in providing the necessary funds, the Department went to work to correct the situation.

Trailers and quonset huts were pressed into service. Existing Reservation schools were enlarged and reorganized to provide a maximum of classroom space. Arrangements were made with nearby communities to receive the older Navajo children in the regular public schools and to have them provided with room and board at Government expense.

All along the line, throughout the arduous months of the program's progress, the utmost cooperation has been extended from every quarter. The program is continuing unabated, and is expected by the middle of fiscal 1956 to have progressed to a point where educational facilities will be available for every school age youngster in the Navajo tribe.

Here is an instance in which partnership—the pooling of effort—has paid immeasurable dividends in development of human resources.

NATIONAL PARKS

Primary concern of the National Park Service is with people and with the provision of a means for them to use profitably the increasing amounts of leisure time they enjoy.

For this reason, the work and the objectives of the Service with respect to natural resource conservation and development differ fundamentally from those of other Federal agencies.

To accomplish its objective, the National Park Service has the responsibility of protecting and preserving major scenic, scientific and historic areas of the United States.

Expenditure of public funds at all governmental levels must be geared to the realization that parks are closely related to progress in all forms of endeavor. Otherwise, they are not going to properly serve the America of the future.

Every dollar prudently spent for park purposes is an investment in the future of our Nation and our people.

It is necessary for the National Park Service to seek and to extend cooperation in many different ways. Cooperative effort is required in the development and management of areas for which the Service is responsible; it is required to meet closely related responsibilities acquired by the Service in the years since its establishment.

Cooperation With Other Agencies

Numerous other Federal agencies are involved in cooperative agreements with the National Park Service. Agencies of the various States often are parties to such efforts as are, to a growing degree, private individuals and groups. Each in his own way contributes to the hastening of achievement of common goals.

The National Park Service forms partnerships with the Bureau of Reclamation and the Corps of Engineers to appraise possible recreational "dividends" accruing from construction of dams and reservoirs.

Detailed planning of recreational developments on reservoirs constructed by these other agencies makes the Service's recreational "know-how" available on a cooperative or partnership basis.

The Service is progressing steadily in its expansion to meet growing needs and toward more efficient and effective administration.

Increased appropriations granted by Congress permit the Service to provide more adequate staffing, and to better manage the areas in its care.

Expanding the Parks

The National Park System today is larger than it has ever been. Since 1953, some 125,000 acres of parkland have been acquired and the boundaries of Everglades National Park were extended to take in an additional 271,000 acres.

Efforts are being made to advance a partnership program for park road construction under which problems of construction and maintenance would be worked out cooperatively with the affected States.

For more than three decades the Bureau of Public Roads has provided engineering and supervision for construction of major roads in areas administered by the National Park Service. This arrangement has assumed greater importance during the past year, with the allocation of more funds than at any previous time in the Service's history for construction of roads, trails and parkways.

Work on Park Roads Accelerating

A total of $35 million has been authorized for roads and trails during the three years beginning with fiscal 1955. The three-year total for parkways is $30 million.

Appropriations and contract authorizations within these sums are permitting the National Park Service to complete important roads on which progress has been halted, such as the Stevens Canyon Road in Mount Rainier National Park. The Service is enabled to provide additional road mileage in recently established areas, and where the need is most urgent to modernize roads either worn out under the present traffic load or unsuited for modern traffic.

Forests of the national parks are more than essential elements of scenic beauty.

They include extensive stands of the most majestic forest growth in the United States. It is both natural and necessary that there should be the closest inter-agency cooperation in the protection of this resource against fire, insect infestations and disease.

The National Park Service has as partners in this protective function the Forest Service of the Department of Agriculture, State forestry agencies, and private forest protective groups.

Problems involving non-Federal holdings within the established boundaries of National Park System areas are being met in part through authorizations to exchange these lands for lands in the public domain.

Best use of this authorization depends for its effectiveness upon the cooperation of the Bureau of Land Management, which has been extended freely and intelligently.

Notable examples are the steady progress being made in "blocking up" Federal ownership in Joshua Tree National Monument, and, more recently, at Saguaro National Monument. In this latter instance, an agreement has been reached on an exchange with the State of Arizona.

In performing such tasks as the survey of the recreational resources of Alaska, the National Park Service has called upon such agencies as the University of Washington and the National Recreation Association to handle certain special phases of the study.

In the historical and geological study of the Cape Hatteras National Seashore Recreational Area, now in progress, the Service is receiving valuable assistance from the Office of Naval Research and from the Laboratory for Marine Studies of the University of Louisiana.

Mission 66

The endeavor to formulate a long range plan for the development and management of the National Park System—designated as Mission 66—has revealed numerous partnership opportunities.

In its earliest stages, Mission 66 disclosed the absolute necessity for close cooperation between the National Park Service on the one hand, and the Forest Service and other land management agencies on the other, if the forward-looking program is to come to its fullest realization.

The effort to bring about, as rapidly as conditions will permit, removal of public use developments which encroach seriously on major natural features also will require partnership activity. It is contemplated that these public use developments would be relocated outside of park boundaries on lands administered by other agencies, insofar as possible.

Improved roads and more rapid transportation have lessened the necessity for placing all such facilities inside extensive park areas. Thus, the way has been opened for their gradual removal to other sites involving less serious impairment of the natural scene.

There has been a close though informal degree of cooperation between the National Park Service and State agencies, from the early days of the Service. Since 1936, cooperation in planning has been a Service responsibility stipulated by Congress, to be exercised only upon request of the responsible State authority.

Closely related is the task of investigating surplus Federal properties sought by State or local agencies for recreational or historic site purposes. During the past year there were 11 such investigations in 8 States and the Territory of Hawaii.

Partnership with Private Enterprise

Yosemite National Park for the first time is on the way to having fully adequate telephone and radio communications, to be furnished by the Pacific Telephone & Telegraph Company. A similar arrangement is being worked out for most of Sequoia and Kings Canyon National Parks. This is expected not only to provide first-rate service, but also to save the Government about $6,000 a year.

These are examples of the kind of progress which is being made steadily, in getting out of certain types of activity which are unduly costly and in which the Service cannot expect to attain satisfactory proficiency.

Ten of the areas administered by the National Park Service benefited from completion of such arrangements during the year, and others are projected.

The past year has seen continuance of an important trend of contributions to advancement of National Park Service objectives, by private individuals, corporations and foundations.

As long ago as 1920, the Congress authorized acceptance of donations to be used in furthering Service projects for the public benefit. In 1935, it created the National Park Trust Fund and Trust Fund Board. Both recognized that the objectives of the Service and the National Park System it manages are a particularly desirable field for benefactions. Donors appreciate that lasting benefits will result.

A notable case was the contribution last year of $500,000 by Jackson Hole Preserve, Inc., to match a Federal appropriation. This nonprofit corporation established by John D. Rockefeller, Jr., also provided funds for the new Jackson Lake Lodge completed this summer in Grand Teton National Park.

In all these varied cooperative activities, the cause of Federal economy is advanced, there is a fair sharing of responsibility among public and private agencies, and the goal of adequate outdoor recreational opportunity for everybody comes more nearly to realization.

FISH AND WILDLIFE RESOURCES

Wildlife management is proving to be one of the most challenging problems in the field of natural resource development because of the ever-mounting number of people and the increased competition for land use.

In meeting common problems of resource development, the Department of the Interior has encouraged the philosophy of a working partnership among the Federal Government, State and local governments, and private interests.

On of the most satisfying experiences of the past year for the Fish and Wildlife Service has been the progress recorded in implementing this philosophy by bringing the Service closer to the States and local communities in the truest sense of partnership.

In every field in which the Service operates, greater effort was directed to cooperative participation and understanding. As a result, the foundations have been laid for one of the most rewarding eras in the history of wildlife conservation in this country.

Aware of the rapidly increasing number of sportsmen and the proportionately greater demands year by year upon fish and wildlife resources, the Service is proceeding as expeditiously as it can in expanding its activities to meet these growing needs.

Expansion of Wildlife Refuges

Since 1953, eight new wildlife refuges have been established and three more are in process of being established. Presently the Service administers 264 national wildlife refuges in 42 States, Alaska, Hawaii and Puerto Rico, as well as 89 fish hatcheries in 42 States.

In all, almost 80,000 additional acres have been acquired for wildlife preservation.

Conversely, the Service and the Department has resisted efforts to reduce the effective work underway in any of these areas.

Waterfowl Management and Protection

Great strides are being made toward improving cooperative ties between Federal and State governments in the management of migratory birds.

Within the past few years all States have organized their waterfowl management programs along flyway lines—the flyway being the unit of management for migratory birds. This action has led to a better understanding of the problems associated with waterfowl management.

The Service has encouraged this organized endeavor by frequent meetings with the Flyway Councils to consider waterfowl management problems. Each of these organizations is represented on the Director's Advisory Committee on Waterfowl so that the State and local viewpoint is presented to the Service before the annual hunting regulations are amended.

Surveys made on the waterfowl breeding grounds are also cooperative in nature.

The Fish and Wildlife Service, the Canadian Wildlife Service, the Provincial Game Branches, and Ducks Unlimited combine their manpower and equipment to cover all of the important nesting areas in Canada. Service biologists cover the important areas in Alaska, while the State conservation agencies, with some help from the Service, carry on surveys in about 25 States.

A vigorous program of land acquisition, to assure living space for waterfowl and other migratory birds, continues as a high priority need in the over-all protection program. Both State and private groups are assuming greater responsibilities each year in supplementing Federal programs in this connection.

Ban on Baiting Continued

The Department has held firm to the ban on baiting—an important though controversial aspect of waterfowl management and protection.

In California, most of the natural waterfowl wintering areas have shrunk because of agricultural expansions. California winters most of the waterfowl of the Pacific Flyway, but the State no longer has sufficient natural habitat. In search of food, the birds concentrate in the three great valleys of California—the Sacramento, the San Joaquin and the Imperial.

Heavy damage to California crops resulted from this concentration. Over the years, several methods of frightening the birds away from unharvested or growing crops were utilized, with varying degrees of success.

In 1953 the California State Legislature approved an act designed to relieve crop depredation by migratory waterfowl through permitting the feeding of birds to attract them away from crop areas. Specified conditions were adopted by the California Fish and Game Commission.

The Fish and Wildlife Service has maintained close watch on the experimental feeding program, with the determination that it should not result in abuses which would lead to revival of baiting. It has been made clear that nothing in the California regulations are to be construed as license to violate the Federal ban on baiting which applies to all 48 States.

Cooperation in Wildlife and Fishery Research

Basic to the management of wildlife resources is a knowledge of game and fish populations.

This is common ground for Federal and State administrators regardless of which eventually exercises jurisdiction. Not infrequently, local and private interests are directly concerned. In this area of common interest, cooperative effort is a recognized necessity and an accomplished fact.

In studies of bird migration, 48 State conservation agencies and numerous universities and scientific organizations cooperate with the Service in banding thousands of birds to trace their migration routes.

"Team" Research Extended

The concept of team research—bringing together specialists in several fields to concentrate upon a complex research problem—has been greatly extended in fishery research during the past fiscal year.

Devices proving effective and advantageous to both "partners" include: Contract research with universities, marine laboratories, and oceanographic institutions; cooperative arrangements with State fishery research units for joint work on problems of mutual interest; and invited participation on cruises of research vessels of specialists in fields related to or supporting fishery biological research.

Commercial Fishing

Faced with increasing fishing effort in Alaska and a serious decline in certain of the salmon runs due in part to unfavorable natural conditions, the Service in 1954 imposed drastic restrictions on commercial fishing in Prince William Sound and southeastern Alaska and redoubled its enforcement efforts to provide more adequate seeding of the pink salmon spawning streams.

Although seriously affected by these restrictions, the salmon industry cooperated to the fullest extent. Cannery operations were consolidated and the plans of operators and fishermen alike were tailored to achieve a substantial reduction in fishing intensity.

Initial results of this vigorous restoration program are encouraging. Increased numbers of spawning pink salmon have brightened the prospects for larger runs in those areas in 1956 and succeeding years.

In fisheries exploration and gear research, cooperative effort is producing valuable discoveries and developments. Commercial fishermen, industry members, and local fishery commissions are consulted in project planning. Researchers from universities and State and private agencies accompany Service research vessels and contribute special skills and knowledge to the problems of finding, evaluating, and efficiently utilizing fishery resources.

In cooperation with the Navy Bureau of Ships, underwater television has been adapted to the study of fishing gear. Service specialists advise commercial fishermen on the proper gear and equipment for entering new fisheries, such as the recently discovered Gulf of Mexico tuna grounds.

Saltonstall-Kennedy Program

In fiscal year 1955, under the terms of the Saltonstall-Kennedy Act which was approved by the President on July 1, 1954, the Service embarked upon a research program designed to help the ailing commercial fishing industry of this country to expand production and to develop new markets for fishery products.

In order to produce practical results for the industry in the shortest possible time, the Service, the States, and the industry joined forces in drafting a research and development program.

Now, at the end of the first year of this new coordinated Government-industry effort, it can be said that the American commercial fishing industry is in a better position to realize its production and marketing potential than at any previous time in its long history.

Controlling Predatory Animals and Harmful Rodents

An excellent example of a highly successful partnership is that participated in by the Service and the farming and stock raising industries of the country to protect livestock and crops from depredations by predatory animals and destructive rodents.

Savings amounting to many millions of dollars annually have resulted, at a relatively slight cost. Cooperators paid 82 percent of the total cost in the past year.

Fish Hatchery Operation

The Federal program for stocking fish in inland waters is being carried on in cooperation with the States to provide better sport for the millions of licensed fishermen.

In fiscal year 1955, the Service operated 89 fish hatcheries in 42 States as its contribution to the maintenance of the sport fishery resource. A large percentage of the fish reared in Federal hatcheries was liberated in waters on Federal land, near military installations and veterans hospitals, and on State-Federal management areas.

Federal Aid Restoration Programs for Sport Fish and Wildlife

Another outstanding example of the partnership concept is the Service's Pitman-Robertson and Dingell-Johnson programs.

Under these programs Federal funds from the excise taxes on sporting arms and ammunition and sport fishing gear are matched in the ratio of three to one with State hunting and fishing license revenues to restore and improve the living conditions for fish and game. The projects are selected and planned by the States and, after approval by the Fish and Wildlife Service, are carried out by the respective State fish and game departments, with the resulting improvements belonging to the States.

The Pittman-Robertson program for wildlife has furnished the vehicle by which the States cooperate with farmers, ranchers, soil conservation districts and others in the planting of food and cover to improve game environment. Each year several thousand new game areas are created in the gullied portions or odd corners of cooperative farms.

With Dingell-Johnson funds many new fishing lakes were developed last year on lands acquired and donated to the States by private individuals and sportsmen's clubs. In several States large scale lake rehabilitation projects have been carried out as cooperative ventures.

One of the most important cooperative research activities is a study of the striped bass on the Atlantic coast. The investigations are guided by a coordinating committee representing the Atlantic States Marine Fisheries Commission, with the Fish and Wildlife Service providing technical direction.

PARTNERSHIP PROGRESS IN THE TERRITORIES

Within our Nation, there are few areas where the concept of partnership in the conversation and development of resources is more meaningful than in the Territories of the United States.

In most of these areas the hope of economic and political progress in the future is dependent upon wise application of cooperative principles today.

The essence of this partnership is found in two kinds of cooperative adjustments: The relation of the Federal Government to territorial and local Governments, and the relation of all governmental institutions—Federal, territorial and local—to the initiative and enterprise of territorial citizens.

In past years, the trend toward Federal interferences and dominance had come to be regarded as desirable in itself, independently of its results.

In the Territories—though in some more than others—the Federal Government completely overshadowed local governments, while private and free enterprise often had become neither private nor free.

In Alaska, for example, land withdrawals were made on the theory that only the Government knew best. Land titles were so entangled with procedural red tape that it sometimes was difficult for an Alaskan to acquire legal ownership of his own home.

An effort is now being made to change this trend.

Transfer of Responsibilities to Local Governments

In the Territories this has meant a transfer of Federal responsibilities to territorial and local Governments, wherever those responsibilities can better be exercised by the local Governments. It has meant also a renewed emphasis upon private rather than Government enterprise, with the Federal Government ceasing to perform economic functions which are not normally within its sphere, and which individual citizens or groups of citizens are prepared effectively to undertake.

Finally, it has meant a policy of affirmative aid and encouragement to programs of economic development by the Federal Government when such a course is deemed in the best interests of all of us.

Expressed in these terms, the partnership principle is by no means inflexible.

The usually varying and often unique characteristics of many of the Territories make possible and, in fact, require differing applications of the principle. In a sense, they are workshops for testing new ideas and differing techniques in applying the concept of partnership to particular times and circumstances.

While the ultimate goals can be the same fundamentally, it would be quite unreasonable to attempt the same methods of cooperation in conserving and developing both human and natural resources in a primitive Pacific island as in modern and politically mature Hawaii. In Alaska, with the Federal Government owning more than 90 percent of the land, economic problems cannot be handled in the same fashion as in California or Hawaii.

The Alaska Railroad

Thus, the Department of the Interior continues to operate The Alaska Railroad. This is not because of a belief in the inherent superiority of Government enterprise, but because the Railroad as yet cannot be operated in accordance with the economic standards which normally prevail in private business.

On the other hand, the Railroad has divested itself of such subsidiary activities as the operation of river boats and the maintenance of commissaries, because these operations were ready to be assimilated within the ordinary scope of business operations.

It has been emphasized that a cardinal feature of our territorial policy has been decentralization of responsibility by transferring from the Federal Government such functions as the Territories can handle effectively.

For politically mature Territories, such as Hawaii and Alaska, this means taking over from the Federal Government all those functions that customarily are performed by State Governments elsewhere.

In Hawaii this process has advanced to such a degree that the Territory is ready for statehood. Military and economic problems so far have delayed a similarly direct solution as applied to Alaska.

Several events of the past year illustrate the Department's concept of partnership as between the Federal Government and Alaska's Territorial Government.

For many years the care of Alaska's mentally ill has been a Federal function administered by the Department's Office of Territories. The Department has devised a program for transferring this function to the Territory of Alaska, and has drafted legislation to implement that program.

To help solve financial problems incident to the transition to territorial control, the Department has proposed Federal grants for construction of mental hospital facilities in Alaska and for aid in meeting operational expenses during the initial years. Granting of substantal acreage of Federal land also has been proposed as a further aid.

Highway Development In Alaska

Highway development in Alaska is another example of progress resulting from the Federal Government working in conjunction with the Territory.

For a half-century the construction and maintenance of primary or "through" roads in Alaska have been solely a Federal responsibility.

Most of this responsibility has been exercised by the Department of the Interior through the Alaska Road Commission which operates with Federal funds.

During the 1955 session of the Territorial Legislature, the Governor urged and the Legislature approved an increase in the motor fuel tax which would make more territorial funds available for highway expansion.

By increasing the total amount of territorial money available for road building and maintenance, Alaska is assuming at least a portion of the responsibility which in the past has been shouldered by the Federal Government.

The contribution of highway facilities to development of resources is readily discernible.

Liquidation of PRRA

Final liquidation of the Puerto Rico Reconstruction Administration should be mentioned as another example of transfer to a Territory of what had been a major Federal responsibility.

This Federal agency was born of depression and performed an essential function during a time of hardship in Puerto Rico. Meanwhile, Puerto Rico has become a Commonwealth of the United States, and the emergency for which the Puerto Rico Reconstruction Administration was created has passed into history.

The agency has been liquidated completely, and several millions of dollars returned to the Treasury.

Such economic functions of the defunct Federal agency as the Government of Puerto Rico wishes to perform now will be a Commonwealth responsibility and not one of the Federal Government.

As another example, the public works for the Virgin Islands—which has been administered by the Department of the Interior—is being transferred to the Virgin Island Government under a Revised Organic Act.

Withdrawal From Non-Government Functions

In the development and conservation of resources, economic cooperation means not only withdrawal from activities in which the Government has been competing with its own citizens, but it means affirmative aid in those instances in which the Federal Government can assist its citizens to do a better job.

Action of The Alaska Railroad in disposing of commissary and river boat operations is illustrative of the first sort of partnership between government and industry.

Similar consideration has been shown for the economic interests of citizens in other Territories.

In the Virgin Islands, the Federal Government has gone out of the hotel business and has sold a Government distillery.

In the Trust Territory of the Pacific Islands, the Department of the Interior has liquidated a Federal Agency, the Island Trading Company, which had been engaged in trade and distribution operations throughout the islands. Economic functions of the agency have been turned over to native-owned trading companies.

In American Samoa, the Department of the Interior has leased a government-owned fish cannery, and as a result exports of that Territory have doubled in value in one year.

Aid In Resource Development

Alaska provides dramatic examples of Government aid and encouragement in the conservation and development of resources.

The Department of the Interior is in the forefront in this sort of Federal activity through the work of the Office of Territories, Bureau of Mines, Geological Survey, Bureau of Land Management, Bureau of Reclamation, Fish and Wildlife Service, and Bureau of Indian Affairs.

The record bears ample testimony to the beneficial effect these various Federal activities have had upon Alaskan development.

One of the Federal aids in the development of Alaska to which the Department of the Interior can point with particular pride is The Alaska Railroad.

During fiscal year 1955, the Railroad enjoyed one of the best years in its history from a financial standpoint. At the same time, it improved its train schedules and its service to shippers.

Plans are far advanced for a seatrain service to Alaska which gives promise of bringing a revolutionary and beneficial change to Alaskan shipping habits. This is expected to be accomplished through cooperation between The Alaska Railroad and a large ocean shipping concern.

Through the work of Department's Alaska Road Commission, more than 3,000 miles of high standard highways have been constructed and are being maintained throughout the Territory. Much of this highway mileage is kept open during the winter months.

The Alaska Public Works Program has continued to make possible additional schools, water systems, paved streets, sewers and other utilities in Alaska's fast-growing communities.

Partnership Aids Industrial Development

On the industrial front, one of the greatest accomplishments thus far has been the building and operation of a $50 million pulp mill near Ketchikan. This achievement was made possible through partnership among Federal and Territorial Governments and private business.

The mill has completed its first year of operation, using logs secured not only by its own force of loggers but those purchased from surrounding communities as well. Thus, its economic benefits have been distributed over a wide area of Alaska. This mill represents the first large scale use of the rich timber resources of the Tongass National Forest.

The Ketchikan pulp mill is a forerunner of similar developments elsewhere in the Territory. At Wrangell, Juneau and Sitka there is more than just a possibility of other large scale uses of Alaska timber. At Wrangell, contracts have been awarded, and at Juneau the timber to be utilized has been advertised for bid.

All these developments are based upon Federal encouragement of private use of publicly-owned timber. Their success depends upon continuance of a partnership arrangement between business interests and the Federal and Territorial Governments.

Petroleum Development In Alaska

The search for petroleum in Alaska again exemplifies the partnership principle.

Here also the Government, as landowner, must establish the conditions which will make resource development possible. These conditions have been established in Alaska, and during the 1955 fiscal year the Bureau of Land Management leased oil rights on more than 500,000 acres. Drilling is underway in several areas around Cook Inlet and in the coastal area east of Cordova.

In addition, the Department has made representations both to the Congress and to the Department of the Navy, looking toward modification of Public Land Order 82 so that 25 million additional acres of Alaska land with oil-bearing possibilities and located outside Naval Petroleum Reserve No. 4 can be opened to exploration.

With so much activity in regions where geologic characteristics are so promising, it seems likely that the search for oil in Alaska will be rewarded with major strikes.

Cooperative Activities In Hawaii

In Hawaii, land for pineapples and sugar, and climate and scenery for tourists are major resources. Cooperation in their development and exploitation has emphasized partnership between the Territory and private industry, with the Federal Government occupying scarcely more than a junior-partner role.

Other than the Hawaiian Islands, Pacific areas cannot show similar large scale partnership results because, in general, their resources are quite meager as compared with either Hawaii or Alaska.

Nonetheless, in highly important ways the partnership principle has been extended to them, with the Federal Government necessarily in a senior-partner role.

Aside from the transfer of trading operations from a Federal agency to island-owned companies, already mentioned, the Federal Government fosters sea and air transportation in Pacific island areas, promotes introduction of new crops such as cocoa, encourages more widespread native ownership of land, assists the islanders in eradicating insect pests, and promotes health and education programs.

CONCLUSION

As this report has indicated, partnership offers a bright hope for meeting soundly and aggressively our pressing resource problems of today and those that are certain to face us increasingly in the future.

Our resource problems are twofold, involving both conservation and development. In terms of development we must make available and use our resources on a tremendously expanded scale. In recent years the dynamic energy of American technology has provided what is perhaps the prime key to this phase of our resource future.

Technology has shown us the way to make better and more complete uses of our old resource standbys—such as wood and coal—as well as enabled us to develop an almost infinite variety of new materials from hitherto little used sources. We make a host of synthetics from coal tars; we take nitrogen from the air and magnesium from the oceans; titanium, zirconium, the rare earths, and many other new metals have emerged with vital roles to play in our exciting industrial drama.

Chemical technology has, indeed, opened wide the casements to a brave new world in which our material needs may be met on order—if we describe the properties of the new substance or material we need, chemistry stands ready to produce it. Our plastic industry for instance, only a few years ago in its infancy, has grown overnight into a new productive giant through its ability to tailor new products from cheap and virtually inexhaustible raw materials.

The doors that atomic energy and other products of our inventive genius will ultimately open we can only guess. But we can be confident that our path leads onward to a constantly better life for all our people as long as we stand firmly by the principles of creative enterprise and constructive teamwork in a partnership attack on the vast problems of sound resource development.

The second, and equally important phase of our resource mission, must be conservation for ourselves and for future generations, of the best and greatest of our heritage of natural beauty.

In our immediate preoccupation with our resource development goals, we cannot forget that man lives for more than material things. The need for surcease from the very technology which offers us so much material progress grows apace as our population grows and our civilization becomes ever more complex and mechanized. We need to freshen our spirits occasionally with the peace of untrammeled nature, with the pure joy of birds in flight, and glimpses into the eternal mystery of our destiny that come to us most often in communion with the things that God, not man, has made.

Thus, we must jealously guard the beauties of our parks and wildlife refuges placed in our trust for our own enjoyment and for that of our children far into the future.

If we keep our eyes firmly fixed on this dual resource task—development and conservation—we shall continue through a partnership of all the American people to use our resources for the perpetual progress of man to heights which today we can only dimly sense.

PART II

ANNUAL REPORTS OF THE BUREAUS AND OFFICES OF THE DEPARTMENT OF THE INTERIOR

Office of the Assistant Secretary Water and Power Development

Fred G. Aandahl, *Assistant Secretary*

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THE Assistant Secretary—Water and Power Development—is responsible for the supervision and direction of the water and power agencies of the Department. These are the Bureau of Reclamation, Bonneville Power Administration, Southeastern Power Administration, and the Southwestern Power Administration. The latter three agencies are solely marketing agencies for the sale of surplus electric power generated at Federal dams in their respective areas. The Bureau of Reclamation undertakes the construction of projects whose primary purpose is the reclamation of arid and semiarid lands in the western part of the United States and also markets power in this area outside the boundaries of the Bonneville Power Administration and Southwestern Power Administration. The activities of these agencies are more fully described in sections of this report covering each of the Department's bureaus and offices.

In addition, the Assistant Secretary—Water and Power Development—exercises responsibilities which are not exclusive to any one of the Department's operating bureaus or agencies, but which involve particularly the consideration of problems of a broad, overall, or policy nature. These include the supervision of the saline water conversion program, which is described in a separate chapter in this report, and coordination, review, and preparation of departmental comments on water and power project proposals submitted by other Federal agencies to this Department. During the fiscal year ended June 30, 1955, the Department, through this office, reviewed 35 reports of the Corps of Engineers, Department of the Army, concerned primarily with flood control and navigation; 1 report of the Department of Agriculture concerned primarily with runoff and waterflow retardation; 3 reports of the Public Health Service, Department of Health, Education, and Welfare, concerning water pollution; and 42 applications for permits and licenses under the Federal Power Act.

The Assistant Secretary—Water and Power Development—also exercises, under delegation from the Secretary of the Interior, direct supervision over activities in the field of defense electric power. These activities are fully described in another section of this report.

The Assistant Secretary—Water and Power Development—actively participated in the negotiation of contracts for the marketing of power in the Southeast and Southwest during fiscal year 1955. These negotiations included discussions with the Carolina Power & Light and preferred agencies for a wheeling arrangement to market the remaining one-third of the John H. Kerr project power in the company's service area. Negotiations for contracts to replace inoperative lease operate with option to purchase transmission contracts and power sales and exchange agreements were continued with generating and transmission cooperatives in the SPA area. Interim operating, sales, and purchase contracts were also negotiated with the G and T cooperatives for this year. At the request of the Assistant Secretary, a review of the hydroelectric potential available, as a result of the recent severe drought in the Southwest area, was made by an interagency group of experts representing the Corps of Engineers, Federal Power Commission, and the Department of the Interior.

Policies were reviewed and formulated for the marketing of power and preparation of adjustments in rates by the Southwestern Power Administration. Work was continued with the Bureau of Reclamation on general marketing criteria for guidance in the disposal of power. The following summarizes the power marketing activities of the Department's four marketing agencies:

Power marketing data, fiscal year 1955

Marketing Agency	Installed capacity (as of June 30, 1955) (kilowatts)	Net energy generated (million kilowatt hours)	Energy marketed (million kilowatt hours)	Gross revenue (thousands of dollars)
Bureau of Reclamation	[1] 5, 208, 050	25, 643	[2] [5] 10, 455	[3] 35, 620
Bonneville Power Administration	[4] 1, 359, 800	8, 613	21, 823	51, 124
Southeastern Power Administration	[4] 1, 031, 000	2, 124	[5] 2, 121	9, 783
Southwestern Power Administration	[4] 426, 000	584	[5] 778	4, 063
Total	8, 024, 850	36, 964	[5] 35, 177	100, 590

[1] Includes 325,000 kilowatts at Corps of Engineers' and 31,500 kilowatts in International Water Commission's projects.

[2] Excludes 14,576 million kilowatt hours delivered at Grand Coulee Dam and Hungry Horse Dam by Bureau of Reclamation to Bonneville Power Administration.

[3] Excludes $16,144,000 revenue received from Bonneville Power Administration.

[4] Capacity at Corps of Engineers projects.

[5] Includes purchased energy.

Instructions were developed and issued for a comprehensive analysis and review of the Missouri Basin program in cooperation with the Inter-Agency Committee on Water Resources.

Studies were continued in cooperation with other interested Federal agencies of Canadian-United States reservoir storage and hydroelectric power projects.

The Assistant Secretary participated with representatives of the Department of the Interior and other interested Federal agencies in further discussions with representatives of the State of California on the proposal of the California Water Project Authority for State acquisition of the Central Valley project.

He also served as departmental representative on the Inter-Agency Committee on Water Resources. The purpose of this Committee is to provide for the coordination of policies and programs of the various Federal agencies concerned with water resources development. During the year, the Committee established field committees in the basins of the Columbia, the Missouri, the Pacific Southwest, and the Arkansas-White-Red.

BUREAU OF RECLAMATION

Wilbur A. Dexheimer, *Commissioner*

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Introduction

GREATER participation by State governments and local communities, private industries and individual citizens paced the program of the Bureau of Reclamation in the development of the water resources in 17 Western States and Alaska during the fiscal year ending June 30, 1955. Legislation enacted or pending in Congress at the close of the year pointed to an even closer partnership in sharing the costs, responsibilities and benefits of Federal Reclamation in 1956.

A highlight of the year was the dramatic service of the Colorado-Big Thompson project to the extensive irrigated areas in northern Colorado which in 1954 experienced the first serious drought in 20 years. The availability of more than 300,000 acre-feet of water from the virtually completed transmountain diversion project prevented total disaster from a withering drought and assured economic and agricultural stability to a farflung area extending from the Rocky Mountains eastwards through the South Platte River Basin to the Colorado-Nebraska State line. Project water deliveries which brought a gross repayment to the Government of $770,880, resulted in an increased crop income to the benefited area of not less than $22 million in that one season.

Increased emphasis was given to cooperative engineering effort with small irrigation districts. There was continued improvement in rehabilitation, reconstruction, and betterment of irrigation projects built many years ago under private initiative. Indicative of this effort were the rehabilitation of irrigation facilities on the Dalton Gardens and Avondale irrigation systems in Idaho; the rehabilitation of the Isleta Diversion Dam and more than 180 miles of drains on the Middle Rio Grande project in New Mexico; and rehabilitation of the Savage Rapids Dam on the Grants Pass project in Oregon.

The Bureau of Reclamation was represented at four international engineering conferences during the year including attendance by the Commissioner at the World Power Conference held in Rio de Janeiro, Brazil, in August 1954, and as an official United States delegate designated by the Department of State at the Fifth International Congress on Large Dams held in Paris, France, in June 1955.

DIVISION OF DESIGN AND CONSTRUCTION

Construction Completed

Construction completed during fiscal year 1955 on Bureau of Reclamation projects in the West and in Alaska provided irrigation facilities to serve about 315,000 acres of land, 133,500 kilowatts of hydroelectric generating capacity, 785 miles of canals, pipelines, laterals, and drains, and more than 470 miles of electrical transmission lines. The investment in this new construction work and in related water resource and land development features totaled $122 million for the fiscal year.

During the fiscal year 482 separate contracts, having a total face value of about $46 million, were awarded for construction, materials, equipment, and supplies for Bureau project undertakings. Of this total contract value, construction contracts comprised about $41 million, or about 89 percent. The 186 construction contracts in progress at the end of the fiscal year had a total value of more than $145 million.

The 1955 fiscal year saw the completion of the Eklutna project in Alaska and the placing in service of the 30,000-kilowatt Eklutna powerplant; the "holing through" of the 6-mile long Tecolote Tunnel on the Cachuma project in California; completion of the Nimbus Dam and its 13,500-kilowatt powerplant on the Central Valley project in California; and completion of the 36,000-kilowatt Alcova powerplant on the Kendrick project in Wyoming.

Other outstanding construction events were the completion of the Sly Park Dam on the Central Valley project in California; the completion of the 3.3-mile long Gateway Tunnel on the Weber Basin project in Utah; the dedication of the Kirwin Dam on the Missouri River Basin project in Kansas; and the start of construction in the Missouri River Basin of the Glendo Dam in Wyoming and the Lovewell Dam in Kansas.

The 1956 fiscal year construction program will continue work on 34 projects and Missouri River Basin project units and will extend irrigation water service to 120,400 acres of new land, provide supplemental irrigation to 82,900 acres, and generate an additional 120,000 kilowatts of hydroelectric power.

Contract Awards

Table 1 lists the major construction contracts (more than $1 million) awarded by the Bureau of Reclamation in fiscal year 1955. Among features for which contracts were awarded were Glendo Dam on the Missouri River Basin project in Wyoming, Lovewell Dam on the Missouri River Basin project in Kansas, 7.6 miles of the Gateway Canal on the Weber Basin project in Utah, and 11.4 miles of highway relocation at the Monticello Reservoir on the Solano project in California.

The principal features completed on Bureau of Reclamation projects in fiscal year 1955 are listed in table 2. The listing includes 1 storage dam, 3 powerplants, 785 miles of canals, pipelines, laterals, and drains, 474 miles of transmission lines, 2 rehabilitated diversion dams, and 189 miles of rehabilitated drains.

TABLE I.—*Major Bureau of Reclamation contracts awarded in fiscal year 1955*

Feature	Project	Amount of award
Glendo Dam, powerplant foundation, and 7.5 miles of roads	Missouri River Basin	$6, 270, 790
Lovewell Dam	do	2, 324, 850
7.6 miles of Gateway Canal	Weber Basin	1, 948, 822
11.4 miles of highway relocation	Solano	1, 663, 806
201.5 miles of Alcova-Gering and 5.6 miles of Lingle Tap—Lingle 115-kilovolt transmission lines.	Missouri River Basin	1, 493, 268
40 miles of pipelines for units 2 and 3, Exeter irrigation district, Friant-Kern Canal.[1]	Central Valley	1, 376, 755
Pineview Dam enlargement and 2¼ miles of highway relocation[1].	Weber Basin	1, 372, 172
48.2 miles of laterals, sublaterals, and wasteways and 6.6 miles of pipelines for Potholes East Canal laterals.	Columbia Basin	1, 297, 368
33 miles of laterals, sublaterals, wasteways and drains and 2.5 miles of pipe siphon for West Canal laterals.	do	1, 211, 386
26 miles of laterals for unit 2, Wellton distribution system	Gila	1, 168, 977
Stringing conductors and overhead ground wires for 130 miles of Big Bend-Huron—Watertown 230-kilovolt transmission line.	Missouri River Basin	1, 127, 942

[1] Pineview Dam was originally constructed as part of the Ogden River project, Utah.

TABLE 2.—*Principal features completed on Bureau of Reclamation projects in fiscal year 1955*

Feature	Project	State
Eklutna Tunnel and powerplant	Eklutna	Alaska.
Nimbus Dam and powerplant	Central Valley	California.
Folsom powerplant structure	do	Do.
Sly Park Dam	do	Do.
2,417-foot Camino Tunnel	do	Do.
5.6-mile Camino conduit	do	Do.
39 miles of laterals for Madera Canal distribution system.	do	Do.
10 miles of pipe laterals for Plainview water irrigation distribution system, Delta-Mendota Canal.	do	Do.
123 miles of pipe laterals for Friant-Kern Canal distribution system.	do	Do.
61 miles of pipe laterals	Cachuma	Do.
Savage Rapids Dam rehabilitation	Grants Pass	Oregon.
71 miles of canals and wasteways	Columbia Basin	Washington.
239 miles of laterals	do	Do.
23 miles of pipelines	do	Do.
9 miles of canals for Kennewick division	Yakima	Do.
27 miles of canals	Gila	Arizona.
44 miles Saguaro-Phoenix-Tucson 115-kilovolt transmission line.	Parker-Davis	Do.
29 miles pipeline for San Jacinto-San Vicente aqueduct.	San Diego	California.
3.3-mile Gateway Tunnel	Weber Basin	Utah.
9 miles of canal and laterals	Eden	Wyoming.
189 miles of drain rehabilitation	Middle Rio Grande	New Mexico.
Isleta Diversion Dam rehabilitation	do	Do.
430 miles of 230-kilovolt transmission lines	Missouri River Basin	North Dakota-South Dakota.
20 miles of Toston and Lombard canals and laterals.	do	Montana.
43 miles of canals and laterals, Bostwick division.	do	Nebraska-Kansas.
61 miles of canals, laterals, and drains, Frenchman-Cambridge division.	do	Nebraska.
Alcova powerplant	Kendrick	Wyoming.
21 miles of supply canals	Colorado-Big Thompson	Colorado.

Progress of Construction

Development of the irrigation system for the Columbia Basin project in Washington progressed during the year to the stage that facilities were available to serve 247,000 acres of lands, the system having been extended to serve an additional 61,000 acres in fiscal year 1955. Completed during the year were 333 miles of canals, laterals, and wasteways. The system of main canals neared completion at year's end.

On the Palisades project in Idaho, excellent construction progress was made in placing the earth embankment of the Palisades Dam, following diversion of the Snake River through the dam's outlet tunnels in August 1954. Good progress was also maintained on the 114,000-kilowatt Palisades powerplant.

Construction of the 12,000-kilowatt Chandler power and pumping plant on the Yakima project in Washington moved ahead of schedule to assure placement of the plant in service during the next fiscal year. Excellent progress was also made on the irrigration system to be served by the pumping installation.

On the Central Valley project in California, substantial progress was made on the project's irrigation distribution and power facilities. For the Friant-Kern Canal distribution system, 122 miles of pipe laterals were completed; 39 miles of open laterals were completed for the Madera Canal distribution system, and 10 miles of pipe laterals were constructed for the Plainview water irrigation distribution system on the Delta-Mendota Canal.

Construction on the American River Division of the Central Valley project advanced to the point of completion of the Nimbus Dam and its 13,500-kilowatt powerplant, and the placing in service of the first of three 54,000-kilowatt generating units of the Folsom powerplant. With the installation of the remaining 2 Folsom units during the next fiscal year, Nimbus and Folsom powerplants will increase the project's power capacity by 175,000 kilowatts. Sly Park Dam was completed as well as the 5.6-mile Camino conduit and the half-mile Camino Tunnel.

Also in California, following the installation of improved drainage and ventilation facilities, excavation of the remaining 4,700 feet of the Cachuma project's 6-mile-long Tecolote Tunnel was resumed in July 1954. The tunnel, one of the most difficult Bureau construction undertakings in recent years because of large inflows of hot water and high humidity, was "holed through" in January 1955. At year's end, the placing of the concrete lining continued in the tunnel. Cachuma project work was also noted by completion of 61 miles of pipe laterals for the Carpinteria and Goleta distribution systems.

In southern California, the remaining 29-mile section of the San Jacinto-San Vicente aqueduct was completed ahead of schedule. The entire 61-mile length of this second barrel of the San Diego aqueduct, which was designed and constructed by the Bureau for the Department of the Navy, was turned over for operation by the Metropolitan Water District of Southern California and the San Diego County Water Authority.

Extension of the Wellton-Mohawk and Dome distribution systems and installation of additional pumping units in the 3 Wellton-Mohawk pumping plants comprised the major work on the Gila project in Arizona. Unit 1 of the Dome Canal, 27 miles long, was completed.

Progress of work on the Weber Basin project in Utah was highlighted by completion of the 3.3-mile Gateway Tunnel. Construction of the project's Wanship Dam was ahead of schedule at the end of the fiscal year, and work on the 4-mile Weber aqueduct and on the 7.6-mile Gateway Canal proceeded on schedule.

On the Middle Rio Grande project in New Mexico rehabilitation of the Isleta Diversion Dam and 189 miles of drains was completed and rehabilitation of the El Vado Dam was substantially completed. In the same State, construction contracts for rehabilitation of the Vermejo project were essentially completed.

The comprehensive program for the development of the land and water resources of the Missouri River Basin project progressed at a good rate. Kirwin Dam in Kansas, a large earthfill structure, was essentially completed. Also in Kansas, Webster Dam neared the midway point of completion, and Lovewell Dam was placed under construction. One of the basin project's major new starts of the year was Glendo Dam and the foundation for the 24,000-kilowatt powerplant construction, starting in December 1954, was sustained at a rapid pace throughout the year.

Other major work was completed on the Missouri River Basin project: 430 miles of "backbone" transmission lines which will transmit power from the large powerplants under construction by the Corps of Engineers on the main stem of the Missouri River in North and South Dakota; 20 miles of the Toston and Lombard canals and laterals in Montana; 43 miles of canals and laterals on the Bostwick division in Nebraska and Kansas; and 61 miles of canals, laterals, and drains under the Frenchman-Cambridge division in Nebraska. On the Sargent unit, also in Nebraska, work was started on the Milburn Diversion Dam and Sargent Canal, the first of several irrigation and flood control facilities planned by the Bureau on the lower reaches of the Platte River and its tributaries.

Construction continued on Tiber Dam in Montana, Pactola Dam in South Dakota, and on about 500 miles of major electrical transmission lines in the Dakotas and about 230 miles of lines in Nebraska.

Alcova powerplant on the Kendrick project in Wyoming was completed, adding 36,000 kilowatts of installed capacity to the Bureau's hydroelectric power system in the Missouri River Basin area.

On the Colorado-Big Thompson project in Colorado, 21 miles of supply canals were completed. The transmountain diversion project's basic facilities were completed last year, except for the authorized Big Thompson powerplant for which construction funds were not available. Work on the South Platte Supply Canal in fiscal year 1956 will complete the final link in the project's water distribution system.

In Alaska, the 4½-mile Eklutna Tunnel was completed on the Eklutna project and the two 15,000-kilowatt generating units in the Eklutna powerplant were placed in full operation, bringing relief to the power-short Anchorage-Palmer area.

The Bureau continued its safety program during the year to prevent personal injuries through the administration and enforcement of modern safety practices and other preventive measures against the hazards of construction work. Indicative of the progress made in reducing the number of accidents in construction operations was the 7-percent reduction of the accident frequency rate below the previous year's rate.

Design Activities and Developments

Designs and specifications for 117 construction contracts were completed during the year. The average cost for these engineering services as related to the overall Bureau of Reclamation construction and rehabilitation program for the 1955 fiscal year was 4.1 percent.

During the year, for the first time in Bureau design undertakings, the technique of full-scale field tests was applied in determining the performance and the most economical design for an earth dam. To obtain necessary data on the settlement changes caused by the loading of the organic silt foundation for the proposed Willard Dam on the Weber Basin project in Utah, a 35-foot-high test embankment containing embedded measuring apparatus was designed and placed under construction on the project.

Considerable design activity centered on the enlargement and rehabilitation of existing dams. Rehabilitation of the spillways and outlet works for many of these structures imposed complex problems not usually encountered in the development of new works and necessitated innovations in design techniques. Typical of such rehabilitation designs were those for enlargement of the Alamogordo Dam spillway, Carlsbad project, New Mexico; enlargement of the Pineview

Dam, Weber Basin project, Utah; repair of the outlet works for Wickiup Dam, Deschutes project, Oregon; and replacement of the Crescent Lake Dam, Crescent Lake Dam project, Oregon.

A significant innovation in the design of fish protective facilities was the development of a system of protective louvered barriers at the intake to the Tracy pumping plant on the Central Valley project in California. Fish from the Sacramento River, seeking the ocean and finding themselves at the intake, will be concentrated at the louvered barriers, and then be transported safely to the lower river.

To assure continued operation of waterway structures subject to icing during severe winter weather, a new method of electrical induction heating of exposed surfaces was incorporated in certain structure designs. The formation of ice, which could render structures or equipment inoperable, is prevented by the heat generated by induction through an embedded electrical conduit.

Improved techniques were developed in analyzing vibrations in structures and equipment and were successfully applied to eliminate objectionable vibration of structures at five powerplants and one pumping plant.

Specification Requirements

To lower the cost of construction and make more efficient use of its engineering forces, the Bureau initiated the procedure of requiring the contractor on major construction work to perform all detailed construction surveys previously carried out by the Government; initial survey layouts and surveys for installation of certain major equipment requiring precise measurement will continue to be made by the Bureau.

Foreign Manufacturers

European manufacturers continued to show active interest in Bureau equipment and materials advertisements. During the year 27 contracts for electrical equipment were awarded to foreign manufacturers or their representatives. These contracts, which included 19 Italian, 5 Austrian, and 3 English contracts, totaled $961,297. For the first half of the fiscal year, under the "Buy American Act," a differential of 25 percent was added to all foreign bids before comparison was made with domestic bids. However, by Executive Order 10582, dated December 17, 1954, the differential was reduced to either 6 percent or 10 percent depending upon how it was applied. Although the total value of foreign awards was less than fiscal year 1954, the number of contracts awarded in fiscal year 1955 to foreign firms more than doubled over fiscal year 1954.

Research Activities

Investigations in the Bureau's engineering laboratories led to improved economy and serviceability of Reclamation projects.

In the hydraulic laboratory a novel and economical wave suppressor was developed for the Central Valley project's Friant-Kern Canal stilling basin to reduce excessive waves formed during high discharge from the 96-inch valves at Friant Dam. Hydraulic laboratory investigations of alternative preliminary designs to provide additional flood capacity for the Alamogordo Dam spillway indicated that improved hydraulic characteristics in the spillway could be achieved at less construction cost than previously contemplated. Other model studies demonstrated the feasibility of increasing the spillway capacity for the Palo Verde Diversion Dam, a minimum of sediment in water being discharged through the canal headworks. Model studies were completed for the standardization of a weir box for dissipating energy and measuring discharge at turnouts from canals.

Economy in placing earth linings for canals was achieved on several projects as the result of the earth laboratory studies on blending soils to meet impermeability and erosion resistance requirements. Laboratory investigations indicated the possible use of soil cement or an inexpensive concrete or mortar lining as canal lining for the proposed Ainsworth Canal in Nebraska, which will traverse the unstable dune sand area.

In concrete materials investigations acceptance standards were developed for lightweight pumice concrete roof slabs, first use of this type of construction having been applied to the Palisades powerplant. Tests of waterproofing membranes for concrete roof and deck construction indicated that butyl rubber sheeting or prefabricated asphalt board may be an acceptable substitute for tar and felt.

The first phase of research in hydration of portland-pozzolan cements, conducted under a National Science Foundation grant—the first grant the Foundation has made to a Government agency—was completed with the collection of minerals required for the study.

In other areas of research, a survey of 5 types of buried asphalt membrane canal lining in service as long as 6 years confirmed laboratory indications that catalytically blown asphalts processed with phosphorous pentoxide have the best prospects for longest service life. Laboratory tests also showed that the toughness and tenacity of asphalt can be increased significantly by the addition of up to 5 percent of rubber in the liquid form.

During the year 141 laboratory reports were issued embracing the subjects of research and testing of concrete materials, hydraulic laboratory studies, bituminous materials, protective coatings, weed control, and structural studies.

Work Performed for Other Agencies

Throughout the year the Bureau's engineering staff was called upon for numerous advisory and testing services by Federal and other public agencies.

Through the application of high-speed electronic computers and Bureau-developed techniques in the use of the equipment, work was performed for the Upper Colorado River Commission in the forecasting of seasonal runoffs. Assistance was also given the International Boundary and Water Commission in the application of high-speed electronic computers to the Commission's extensive studies of reservoir operations for Falcon Dam and the proposed Diablo Dam. Geologic advisory service was performed for the International Boundary and Water Commission in studies of the foundation problems at the Diablo Dam site.

The Atomic Energy Commission sought advice on the use of geophysical methods in locating uranium ore. Bureau geophysicists and geophysical equipment were provided the Commission for experimental work in the exploration of uranium deposits in the Black Hills area in South Dakota and adjacent areas.

Bureau engineers participated in a conference with Department of the Navy representatives in recommending methods of repairing the cracks in the Navy's 50,000,000-gallon reservoir at Hawthorne, Nev. During the year the Bureau completed its analyses of stress from strain meters embedded in the mass concrete of the city of Seattle's Ross Dam and prepared a comprehensive report on the analyses which had been conducted under a cooperative investigation program between the city of Seattle and the Bureau since 1943. Also, for the city of Seattle, studies of the spillway designs for the Gorge High Dam were carried out in the Bureau's hydraulic laboratory.

Bureau laboratory advisory and technical services were also made available to the Bureau of Indian Affairs in investigations of the concrete in Coolidge Dam, to the International Boundary and Water Commission in its studies of controlling corrosion in the penstocks in both the United States and Mexican powerplants at Falcon Dam, and to the San Diego County Water Authority in hydraulic measurement studies for the San Diego aqueduct.

Construction Costs

Although construction wage rates and material costs increased about 4 percent during fiscal year 1955, Bureau of Reclamation construction costs averaged about 4 percent less than costs experienced during the previous fiscal year. However, construction costs began to increase during the second half of fiscal year 1955, and by June 1955 had risen to about the same level as June 1954. Wage settlements and strikes near the end of the fiscal year, coupled with the record-breaking pace of the construction industry, were expected to force reclamation construction costs on up from the June 1955 level.

Bidding interest in all types of reclamation construction work decreased noticeably from the interest shown in fiscal year 1954, possibly reflecting the tremendous amount of other construction work in progress. The average number of bids per construction schedule, amounting to 8.8 for the second half of fiscal year 1954, dropped to 7.3 for the first half of fiscal year 1955, and to 6.6 for the second half of the fiscal year.

Table 3 shows cost indexes for Bureau of Reclamation construction work based on the combined costs of materials and labor supplied by contractors and materials and labor supplied by the Government.

TABLE 3.—*Bureau of Reclamation construction indexes, fiscal year 1955*

Cost indexes based on January 1940 costs=1.00	July 1954	January 1955	June 1955
Dams:			
Earth	2.10	1.96	2.10
Concrete	2.15	2.05	2.16
Pumping plants:			
Building and equipment	2.55	2.57	2.60
Structures and improvements [1]	2.75	2.75	2.81
Equipment	2.35	2.36	2.36
Pumps and prime movers	2.45	2.44	2.44
Accessory electric and miscellaneous equipment	2.25	2.24	2.24
Discharge pipes	2.80	2.88	2.96
Canals and conduits:			
Canals	2.40	2.16	2.26
Conduits (tunnels, free flow, concrete lined)	2.55	2.58	2.62
Laterals and drains	2.70	2.78	2.85
Powerplants, hydro:			
Building and equipment	2.45	2.48	2.50
Structures and improvements [1]	2.70	2.71	2.78
Equipment	2.35	2.34	2.35
Turbines and generators	2.40	2.36	2.35
Accessory electrical equipment	2.25	2.28	2.29
Miscellaneous equipment	2.30	2.34	2.40
Penstocks	2.80	2.88	2.96
Transmission switchyards and substations	2.55	2.57	2.56
Transmission lines (wood pole 115-kilovolt)	2.10	2.18	2.06
Transmission lines (steel tower 230-kilovolt)	2.25	2.29	2.33
Permanent general property: Buildings	2.60	2.67	2.71
Roads and bridges:			
Primary roads	2.30	2.31	2.33
Secondary roads, unsurfaced	2.05	2.04	2.06
Bridges (steel)	2.75	2.83	2.87
Composite index	2.35	2.26	2.36

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[1] Indexes for structures and improvements on pumping plants and powerplants are based on a reinforced concrete structure.

Drainage and Ground Water Problems

Progressive improvement in the many aspects of the Bureau's drainage and ground-water activities continued during the year. Important advances were made in the analytical approach to the solution of drainage and ground-water problems. Basic theories and new mathematical formulas were derived to assist in predicting drainage problem areas and in forecasting the behavior of ground water after irrigation and the suitability of lands for irrigation. New techniques were also developed for appraising the feasibility of drainage by pumping from ground water in irrigated areas and new formulas were derived for analyzing water movement in "tight" soils. Limited and controlled water applications were studied as a means of reducing drainage requirements or of permitting irrigation of lands which cannot be readily drained.

Progress was also made in the drainage and ground-water phases of operating projects as indicated by the increased cooperative effort by water users on Bureau projects to adequate drainage and construction of new drains on irrigated lands. Several projects constructed drains during the year and one project completely rehabilitated and improved its drainage system, restoring to productivity lands which for many years had been only marginal or entirely unproductive. Other operating projects undertook drainage investigations, the Bureau advising and assisting in technical aspects and in reimbursable financing. Technical studies were made for and counsel was given to water users' organizations and other entities on claims involving alleged damage from ground water resulting from project operation.

Close liaison among Bureau engineers and exchange of information with other Federal agencies and committees of technical organizations made the Bureau's progress in drainage and ground-water developments available to the profession. Bureau engineers also assisted foreign engineers in their drainage and ground-water work, and in turn, gained information on foreign experiences for application to Bureau projects.

TABLE 4.—*Bureau of Reclamation Storage Dams, June 30, 1955*

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Alaska: Eklutna	Eklutna	Eklutna Creek	Earth dike and concrete buttressed wall weir.	182,100	26	555	5,000	1955
Arizona: Salt River	Bartlett	Verde	Concrete multiple-arch	[1] 179,500	287	1,063	182,000	1939
	Cave Creek [2]	Cave Creek	do	11,000	109	1,648	18,775	1923
	Horse Mesa	Salt	Concrete arch, powerplant	[1] 245,100	300	803	162,000	1927
	Mormon Flat	do	do	[1] 57,900	224	505	59,900	1925
	Roosevelt	do	Masonry arch-gravity, powerplant	[1] 1,398,000	280	1,125	355,800	1911
	Stewart Mountain	do	Concrete arch, powerplant	69,800	207	1,260	120,500	1930
Arizona-California: Parker-Davis.	Parker [2]	Colorado	do	717,000	320	856	380,000	1938
Arizona-Nevada:								
Boulder Canyon	Hoover (Boulder)	do	Concrete arch-gravity, 2 powerplants.	31,142,000	726	1,244	4,400,000	1936
Parker-Davis	Davis	do	Earth, powerplant	1,820,000	200	1,600	4,357,500	1950
California:								
Cachuma	Cachuma	Santa Ynez	Earth	232,000	275	2,975	6,600,000	1953
	Glen Anne	Offstream	do	500	102	240	121,000	1953
	Lauro	do	do	642	110	540	472,000	1952
Central Valley	Folsom	American [3]	Concrete gravity, embankment wings, powerplant.	1,000,000	340	1,400	1,450,000	(4)
	Friant [2]	San Joaquin	Concrete gravity	521,000	319	3,488	2,135,000	1942
	Keswick [5]	Sacramento	do	23,800	159	1,046	197,000	1945
	Martinez	Offstream	Earth		38	1,200	183,450	1947
	Nimbus	American	Earth, concrete overflow section	7,600	76	1,093	205,000	1955
	Shasta	Sacramento	Concrete curved-gravity, embankment wing, powerplant.	4,493,000	602	3,460	6,541,000	1945
	Sly Park	Sly Park Creek	Earth, rock	47,130	190	760	657,000	1955
Orland	East Park	Little Stony Creek	Concrete arch-gravity	51,000	139	226	15,745	1910
	Stony Gorge	Stony Creek	Concrete slab-and-buttress	[1] 50,200	139	868	43,100	1928
Solano	Monticello	Putah Creek	Concrete arch	1,600,000	295	1,000	270,000	(4)
Colorado:								
Colorado-Big Thompson	Carter Lake	Offstream	Earth (2 dikes)	117,000	200	1,235	2,900,000	1952
	Dixon Canyon	do	Earth	(6)	240	1,215	3,004,000	1949
	Flatiron	do	do	19,000	70	1,730	364,500	1953
	Granby	Colorado	do	546,000	245	885	2,901,300	1950
	Green Mountain	Blue	Earth, powerplant	154,600	300	1,150	4,406,000	1943
	Horsetooth	Offstream	Earth	147,000	150	1,610	1,890,000	1949
	Marys Lake [5]	do	Earth (2 dikes), powerplant	700	40	1,300	60,500	1950
	Olympus [2]	Big Thompson	Concrete gravity, embankment wing	2,850	60	1,850	300,000	1949
	Rattlesnake	Offstream	Earth	2,000	105	1,080	408,000	1952
	Shadow Mountain	Colorado	do	15,000	44	600	210,000	1946
	Soldier Canyon	Offstream	do	(6)	220	1,420	3,288,000	1949
	Spring Canyon	do	do	(6)	215	1,115	2,213,000	1948
	Willow Creek	Willow Creek	do	11,150	135	1,075	384,000	1953
Fruitgrowers Dam	Fruitgrowers	Alfalfa Run	do	4,600	55	1,520	135,500	1938
Mancos	Jackson Gulch	Offstream	do	10,000	181	1,895	1,988,000	1948

Pine River	Vallecito	Pine	do	129, 700	162	4, 010	3, 738, 000	1947
Uncompahgre	Taylor Park	Taylor	do	[1] 106, 200	206	675	1, 115, 100	1931
San Luis Valley	Platoro	Conejos	do	60, 000	165	1, 538	909, 884	1952
Idaho-Oregon: Boise	Anderson Ranch	Boise, South Fork	Earth, powerplant	493, 200	456	1, 350	9, 653, 300	1950
	Arrowrock	Boise	Concrete arch-gravity	[1] 286, 600	354	1, 150	636, 000	1915
	Cascade	Payette, North Fork	Earth	704, 100	107	785	395, 000	1948
	Deadwood	Deadwood	Concrete arch	[1] 161, 900	165	749	56, 400	1931
	Deer Flat, Upper	Offstream	Earth	190, 100	74	4, 000	1, 245, 000	1908
	Deer Flat, Lower	do	do		46	7, 200	1, 240, 000	1908
	Deer Flat, Middle	do	do		16	950	22, 500	1908
Idaho-Wyoming:								
Minidoka	American Falls	Snake	Concrete gravity, embankment wings.	[1] 1, 700, 000	94	5, 227	313, 600	1927
	Jackson Lake	do	do	[1] 847, 000	70	4, 920	491, 700	1911
	Minidoka [2]	do	Earth with concrete, powerhouse section, powerplant.	[1] 95, 200	86	4, 475	257, 300	1906
	Grassy Lake	Grassy Lake	Earth	15, 200	118	1, 170	541, 600	1939
	Island Park	Snake, Henry's Fork	do	127, 200	91	9, 448	464, 000	1938
Palisades	Palisades	South Fork, Snake River.	do	1, 400, 000	260	2, 100	13, 571, 000	(4)
Kansas:								
Bostwick division (Missouri River Basin).	Lovewell	White Rock Creek	Earth (1 dike)	94, 000	66	8, 500	3, 121, 700	(4)
Smoky Hill division (Missouri River Basin).	Cedar Bluff	Smoky Hill	do	368, 100	204	11, 000	8, 917, 000	1951
Kansas-Colorado:								
Solomon division (Missouri River Basin).	Kirwin	North Fork, Solomon River.	do	315, 000	170	12, 600	9, 180, 000	1955
	Webster	Solomon River	Earth, rock	(4)	108	10, 600	5, 500, 000	(4)
St. Francis (Missouri River Basin).	Bonny	South Fork, Republican River.	do	175, 000	160	9, 265	8, 530, 000	1951
Montana:								
Bitter Root	Como	Rock Creek	do	34, 800	65	2, 550	1, 106, 000	1910
Hungry Horse	Hungry Horse	Flathead, South Fork	Concrete arch-gravity, powerplant	3, 468, 000	564	2, 115	3, 086, 200	1952
Huntley	Anita	Offstream	Earth	[1] 400	42	1, 050	142, 800	1937
Milk River	Fresno	Milk	do	129, 100	111	2, 070	2, 105, 000	1939
	Nelson	Offstream	Earth (5 dikes)	85, 500	28	9, 900	232, 600	1915
	Sherburne Lakes	Swiftcurrent Creek	Earth	[1] 66, 100	96	1, 086	227, 600	1921
Sun River	Gibson	Sun, North Fork	Concrete arch	[1] 105, 000	196	960	167, 500	1929
	Pishkun	Offstream	Earth (8 dikes)	46, 400	50	9, 180	599, 300	1921
	Willow Creek	Willow Creek	Earth, semihydraulic fill	[1] 32, 400	93	650	254, 186	1911
Helena-Great Falls division (Missouri River Basin).	Canyon Ferry	Missouri River	Concrete gravity	2, 050, 000	220	1, 010	414, 700	1954
Lower Marias division (Missouri River Basin).	Tiber	do	Earth, rock	1, 397, 000	205	4, 300	5, 375, 000	(4)

See footnotes at end of table.

TABLE 4.—*Bureau of Reclamation Storage Dams, June 30, 1955*—Continued

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Nebraska:								
Frenchman-Cambridge division (Missouri River Basin).	Enders	Frenchman Creek	Earth	74, 000	134	2, 603	1, 951, 000	1950
	Medicine Creek	Medicine Creek	do	93, 000	180	5, 630	2, 883, 000	1950
	Trenton	Republican	do	172, 000	95	7, 800	8, 130, 000	1954
Mirage Flats	Box Butte	Niobrara	do	31, 300	87	5, 508	1, 422, 000	1946
Nebraska-Wyoming: North Platte.	Guernsey	North Platte	Earth, powerplant	48, 100	135	560	586, 200	1927
	Lake Alice, upper	Offstream	Earth	11, 400	30	3, 100	240, 600	1913
	Lake Alice, lower	do	do		23	2, 550	119, 000	1912
	Minatare	do	do	[1] 60, 800	63	3, 700	696, 100	1915
	Pathfinder	North Platte	Masonry arch-gravity	[1] 1, 070, 000	214	1, 070	65, 700	1909
	Pathfinder dike	do	Earth		38	1, 650	152, 200	1909
Nevada:								
Humboldt	Rye Patch	Humboldt	Earth	[1] 179, 000	80	914	356, 300	1936
Newlands	Lahontan	Carson	Earth, powerplant	[1] 273, 600	162	5, 400	733, 100	1915
	Lake Tahoe [2]	Truckee	Concrete slab-and-buttress, lake outlet regulator.	[1] 732, 000	16	109	430	1913
Nevada-California: Truckee Storage.	Boca	Little Truckee	Earth	41, 200	116	1, 629	911, 900	1939
New Mexico:								
Carlsbad	Alamogordo	Pecos	Earth and rockfill	156, 800	148	3, 084	1, 914, 900	1937
	Avalon [2]	do	Earth	7, 000	58	1, 025	202, 300	1891
	McMillan	do	do	38, 700	57	2, 114	234, 000	1894
Middle Rio Grande	El Vado	Rio Chama	Earth—Steel membrane on upstream face.	200, 300	175	1, 300	607, 802	(7)
Rio Grande	Picacho South	Picacho Arroyo, South Branch.	do	[8] 400	29	1, 620	91, 000	1954
	Picacho North	Picacho Arroyo, North Branch.	do	[8] 565	45	1, 600	149, 000	1953
Vermejo	Dam No. 2	Offstream	do	2, 900	16	10, 700	206, 000	1954
	Dam No. 13	do	do	5, 000	32	8, 200	248, 000	1954
	Stubblefield (1 dike)	do	do	16, 000	47	15, 700	827, 000	1954
New Mexico-Texas: Rio Grande.	Caballo [2]	Rio Grande	do	340, 850	112	4, 558	1, 244, 200	1938
	Elephant Butte	do	Concrete gravity, powerplant. (1940).	[1] 2, 185, 400	301	1, 674	629, 500	1916
North Dakota:								
Heart division (Missouri River Basin).	Heart Butte	Heart River	Earth	450, 000	174	1, 850	1, 222, 000	1949
	Dickinson	do	do	16, 500	69	2, 225	326, 000	1950
Missouri-Souris division (MRB).	Jamestown	James	do	1, 460	100	1, 400	960, 000	1953
Oklahoma: W. C. Austin	Altus [2]	Red, North Fork	Concrete gravity, masonry-faced	[1] 151, 700	110	1, 112	70, 200	1945
Oregon:								
Baker	Thief Valley	Powder	Concrete slab-and-buttress	17, 400	70	390	6, 288	1932
Burnt River	Unity	Burnt	Earth, rock-faced	25, 800	83	675	253, 600	1938

Deschutes	Crane Prairie	Deschutes	Earth	55, 300	36	285	29, 700	1940
	Ochoco	Ochoco Creek	do	47, 500	125	1, 350	750, 000	[9] 1921
	Wickiup	Deschutes	do	187, 300	100	13, 860	1, 852, 000	1949
	Wickiup-East Dike	do	do		28	3, 420		1949
Umatilla	Cold Springs	Offstream	do	[1] 50, 000	117	3, 450	793, 400	1908
	McKay	McKay Creek	Earth, concrete-faced	[1] 73, 800	180	2, 700	2, 363, 800	1927
Vale	Agency Valley	Malheur, North Fork	Earth	59, 900	110	1, 850	645, 300	1935
	Warm Springs	Malheur, Middle Fork	Concrete arch	192, 400	106	469	19, 500	1919
Oregon-California: Klamath	Clear Lake	Lost	Earth	527, 000	39	840	63, 400	1910
	Gerber	Miller Creek	Concrete arch	[1] 94, 300	88	485	11, 900	1925
	Link River	Link	Concrete slab-and-buttress, lake outlet regulator.	[1] 873, 000	22	435	2, 200	1921
Oregon-Idaho: Owyhee	Owyhee [2]	Owyhee	Concrete arch-gravity	1, 120, 000	417	833	537, 500	1932
South Dakota:								
Cheyenne division (Missouri River Basin).	Angostura	Cheyenne	Concrete gravity, embankment wing.	220, 000	187	1, 900	749, 600	1949
	Pactola	Rapid Creek	Earth, rock	99, 000	230	1, 340	2, 400, 000	(4)
Belle Fourche	Belle Fourche	Owl Creek	Earth, concrete-faced	[1] 177, 500	122	6, 262	1, 783, 200	1911
Rapid Valley	Deerfield	Castle Creek	Earth	15, 700	133	825	607, 400	1947
Grand division (Missouri River Basin).	Shadehill	Grand	do	467, 000	145	1, 900	3, 500, 000	1951
Texas: Colorado River	Marshall Ford	Colorado (Texas)	Concrete gravity, embankment wings, powerplant.	1, 951, 300	278	5, 093	3, 579, 000	1942
Utah:								
Hyrum	Hyrum [2]	Little Bear	Earth	18, 800	116	540	435, 600	1935
Moon Lake	Midview	Offstream	do	5, 800	54	663	138, 900	1937
	Moon Lake	Lake Fork, West Fork	do	[1] 35, 800	110	1, 108	513, 100	1938
Newton	Newton	Clarkson Creek	do	5, 500	101	4, 781	410, 000	1946
Ogden River	Pine View	Ogden	do	43, 600	103	480	267, 700	1937
Provo River	Deer Creek	Provo	do	152, 600	235	1, 304	2, 827, 900	1941
Scofield	Scofield	Price	do	73, 000	125	575	202, 700	1946
Strawberry Valley	Strawberry	Strawberry	do	283, 000	79	488	117, 900	1913
Weber Basin	Wanship	Weber	do	60, 000	170	2, 000	3, 021, 000	(4)
Weber River	Echo	Weber	do	73, 900	158	1, 887	1, 539, 800	1931
Washington:								
Columbia Basin	Grand Coulee	Columbia	Concrete gravity, 2 powerplants and pumping plant.	9, 402, 000	550	4, 173	10, 585, 000	1942
	Dry Falls	Offstream	Earth	1, 275, 000	94	9, 800	1, 605, 000	1949
	North	do	do		150	1, 450	1, 471, 500	1951
	Long Lake	do	do	65, 000	130	1, 900	1, 462, 000	1948
	O'Sullivan	Lower Crab Creek	do	[10] 675, 000	200	19, 000	8, 753, 000	1949
Okanogan	Conconully	Salmon Creek	Earth, hydraulic fill	[1] 13, 000	70	1, 000	359, 000	1910
	Salmon Lake	do	Earth	[1] 10, 500	42	1, 260	194, 900	1921
Yakima	Bumping Lake	Bumping	do	[2] 33, 700	45	3, 660	252, 600	1910
	Clear Creek	Tieton, North Fork	Concrete arch	[2] 5, 300	80	404	5, 800	1914
	Cle Elum	Cle Elum	Earth	436, 900	135	750	1, 411, 300	1933
	Kachess	Kachess	do	[1] 239, 000	114	1, 400	199, 600	1912
	Keechelus	Yakima	do	157, 800	105	6, 550	683, 500	1917
	Tieton	Tieton	Earth, semihydraulic fill	[1] 198, 000	235	920	2, 048, 600	1925

See footnotes at end of table.

TABLE 4.—*Bureau of Reclamation Storage Dams, June 30, 1955*—Continued

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Wyoming:								
Boysen division (Missouri River Basin).	Boysen	Big Horn	Earth, powerplant	1, 493, 000	220	1, 000	1, 689, 000	1952
Cheyenne division (Missouri River Basin).	Keyhole	Belle Fourche	Earth	510, 000	165	3, 420	1, 300, 000	1952
Eden	Big Sandy	Big Sandy Creek	do	65, 000	80	2, 300	840, 000	1952
Kendrick	Alcova [2]	North Platte	do	190, 700	265	763	1, 635, 300	1938
	Seminoe	do	Concrete arch, powerplant	[1] 1, 026, 000	295	530	210, 200	1939
Oregon Trail division (Missouri River Basin).	Glendo	do	Earth (3 dikes)	800, 000	207	4, 465	3, 021, 300	(4)
	Kortes [5]	do	Concrete gravity, powerplant	4, 800	240	440	147, 000	1951
Riverton	Bull Lake	Bull Lake Creek	Earth	[1] 152, 000	81	3, 456	819, 600	1938
	Pilot Butte	Offstream	Earth, semihydraulic fill	[1] 31, 600	51	1, 300	135, 300	1926
Wyoming-Montana: Shoshone.	Deaver	do	Earth	680	14	1, 300	30, 300	1918
	Ralston	do	do	1, 500	35	2, 200	24, 700	1908
	Buffalo Bill	Shoshone	Concrete arch, powerplant	456, 600	325	200	82, 900	1910

[1] Live storage—dead storage not evaluated.

[2] Storage and diversion.

[3] Under construction by U. S. Corps of Engineers. Bureau of Reclamation will operate reservoir after completion.

[4] Under construction.

[5] Power dam—water supply for generation of power.

[6] Horsetooth Reservoir formed by 4 dams.

[7] Nonreclamation construction. Rehabilitated by U. S. B. R. in 1955.

[8] For flood retention only.

[9] Rehabilitated by the Bureau of Reclamation in 1950.

[10] Majority of active storage behind O'Sullivan Dam provided through wasteways from primary irrigation features of projects.

DEFINITIONS

Capacity: Acre-feet of reservoir storage provided by highest controlled water surface.

Height: Feet between lowest point in foundation and normal crest of dam.

Length: Feet of barrier in dam and integral features constructed between natural abutments.

Volume: Cubic yards of all material in dam and its appurtenant features.

Year: Date original construction was completed. (Other tabular data include supplemental construction.)

TABLE 4A—*Bureau of Reclamation diversion dams, June 30, 1955*

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Arizona: Salt River	Granite Reef	Salt	Concrete weir	3,600	18	1,128	35,000	1908
	Joint Head	do	Concrete weir, embankment wing	200	4	2,600	5,400	1914
	Power Canal	do	do	220	8	862	16,000	1906
Arizona-California:								
Gila and Boulder Canyon, All-American Canal system.	Imperial	Colorado	Concrete slab-and-buttress weir, desilting works.	17,160	23	3,475	196,790	1938
Yuma	Laguna	do	Rockfill weir, concrete-surfaced	1,950	10	4,780	486,800	1909
California:								
Orland	East Park Feed Canal	Stony Creek	Concrete arch, overflow	200	28	271	1,777	1914
	Northside	do	Concrete weir, removable crest	80	3	375	270	1913
	Southside	do	Concrete weir	140	3	895	3,600	1916
Central Valley	Camp Creek	Camp Creek	Concrete, overflow weir	500	20	[1] 43	3,000	1953
Colorado:								
Fruitgrowers Dam	Dry Creek	Dry Creek	Concrete weir	100	5	36	242	1940
Grand Valley	Grand Valley	Colorado	Concrete weir, movable crest	1,425	14	543	17,990	1916
Uncompahgre	East Canal	Uncompahgre	Concrete weir, embankment wing	330	8	764	1,009	1915
	Garnet	do	Rockfill weir, concrete-surfaced	50	4	75	500	(2)
	Gunnison	Gunnison	Timber-crib weir, concrete wings, removable crest.	1,000	10	244	3,200	1912
	Ironstone	Uncompahgre	Concrete gate-structure, timber-crib wing.	350	8	[1] 31	155	(2)
	Loutsenhizer	do	Timber weir	290	9	114	400	[2] 1883
	Montrose and Delta	do	Concrete gate-structure, movable crest.	450	12	68	500	[2] 1883
	Selig	do	Timber weir, removable crest	300	10	96	500	(2)
Colorado-Big Thompson	North Poudre	Cache la Poudre	Concrete weir, embankment wing	250	18.5	200	8,700	1952
Idaho: Lewiston Orchards	Sweetwater	Sweetwater Creek	Rockfill weir, concrete diaphragm	77	8	80	400	1948
	Webb Creek	Webb Creek	do	20	10	75	600	1948
Idaho-Oregon: Boise	Black Canyon [3]	Payette	Concrete gravity, overflow, removable crest, powerplant.	1,360	111	1,039	81,204	1925
	Boise River	Boise	Concrete and masonry weir, removable crest, powerplant.	2,815	39	500	26,100	1908
Idaho-Wyoming: Minidoka	Cascade Creek	Cascade Creek	Timber-crib weir, removable crest	220	6	217	3,068	1937
	Cross Cut	Henry's Fork	Concrete weir	590	10	457	7,375	1937
Montana:								
Bitter Root	Rock Creek	Rock Creek	Timber-crib weir	320	6	30	150	[2] 1910
Frenchtown	Frenchtown	Missoula	Earth (includes 3 dikes), nonoverflow.	170	13	489	12,176	1936
Huntley	Yellowstone River	Yellowstone	Concrete weir	400	8	250	1,674	1934
Milk River	Dodson	Milk	Timber-crib weir, removable crest, embankment wings.	1,450	22	8,154	87,355	1910
	Saint Mary	St. Mary	Concrete weir	530	6	198	1,230	1915
	Swift Current	Swift Current Creek	Earth, timber-crib core, nonoverflow.		13	4,800	98,400	1915
	Vandalia	Milk	Concrete slab-and-buttress weir, movable crest, embankment wing.	250	32	2,350	15,207	1917
Sun River	Sun River	Sun, North Fork	Concrete arch, overflow	1,400	114	261	6,466	1915

See footnotes at end of table.

TABLE 4A—*Bureau of Reclamation diversion dams, June 30, 1955*—Continued

State and project	Name of dam	River	Type	Capacity	Height	Length	Volume	Year
Montana-North Dakota: Lower Yellowstone.	Lower Yellowstone	Yellowstone	Timber-crib weir, embankment wings.	840	4	800	22,500	1910
Nebraska:								
Bostwick division (MRB).	Superior-Courtland	Republican	Concrete ogee weir, embankment wings.	169	21	8,075	178,000	1950
Mirage Flats	Dunlap	Niobrara	Concrete weir, embankment wing	220	6	577	5,100	1945
Frenchman-Cambridge (MRB).	Cambridge	Republican	do	325	33	432	13,850	1948
	Bartley	do	do	130	35	1,015	58,000	1954
Middle Loup division (MRB).	Milburn	Middle Loup	Concrete weir, embankment	260	12	76	1,700	[4]
Nebraska-Wyoming: North Platte.	Dry Spotted Tail Creek	Dry Spotted Tail Creek	Sheet steel pile and earth		13	255	650	1954
	Horse Creek	Horse Creek	Concrete weir, embankment wing	430	6	720	5,260	1923
	Tub Springs Creek	Tub Springs Creek	Sheet steel pile and earth		9	205		1954
	Whalen	North Platte	Concrete weir, embankment wing	3,700	11	2,460	81,700	1909
Nevada: Newlands	Carson River	Carson	Concrete gate-structure	1,950	14	241	2,707	1905
	Derby	Truckee	Concrete gate-structure, embankment wing.	1,500	15	1,331	36,572	1905
New Mexico:								
Fort Sumner	Fort Sumner	Pecos	Concrete weir	100	35	715	24,660	1951
Middle Rio Grande	Isleta	Rio Grande	Concrete gate-structure	1,051	5	674	2,823	[5] 1935
Vermejo	Vermejo	Vermejo	Concrete weir, overflow, embankment wing.	600	5	1,021	4,428	[6] 1910
New Mexico-Texas: Rio Grande.	American [7]	Rio Grande	Concrete weir, movable crest, embankment wings.	1,110	5	9,306	67,667	[2] 1938
	Leasburg	do	Concrete weir, embankment wing	600	6	2,865	22,500	1908
	Messilla	do	do	890	4	3,445	23,600	1916
	Percha	do	Concrete weir, movable crest, embankment wings.	350	9	2,720	43,238	1917
	Percha Arroyo	Percha Arroyo	Earth, nonoverflow	30,000	19	2,489	192,884	1939
	Riverside	Rio Grande	Concrete weir, movable crest, embankment wings.	1,000	6	3,370	145,150	1928
Oregon:								
Deschutes	North Canal	Deschutes	Concrete arch-gravity, overflow	1,000	28	293	[8] 4,900	[2] 1912
Grants Pass	Savage Rapids	Rogue	Concrete, gravity and multiple arch	207	40	392	5,600	[2,9] 1921
Umatilla	Feed Canal	Umatilla	Concrete weir, embankment wing	350	4	2,100	14,100	1907
	Maxwell	do	Concrete and timber-crib weir, embankment wing.	140	5	400	464	1915
	Three Mile Falls	do	Concrete multiple-arch, overflow	360	23	915	5,068	1914
Vale	Harper	Malheur	Concrete gate-structure, embankment wing.	660	21	914	9,258	1929
Oregon-California: Klamath	Lost River	Lost	Concrete multiple-arch, overflow, embankment wings.	1,200	26	675	19,915	1912
	Lower Lost River	do	Concrete slab-and-buttress	810	12	324	689	1921
	Malone	do	Concrete gate-structure, embankment wing.		18	515	24,600	1923

	Miller	Miller Creek	Concrete weir, removable crest, embankment wings.		5	290	1,615	1924
South Dakota: Belle Fourche	Belle Fourche	Belle Fourche	Concrete weir, embankment wing	1,635	18	2,523	35,700	1907
Utah:								
Hyrum	Hyrum	Little Bear, East Fork	Rockfill weir, embankment wing	90	1	520	2,900	1937
Moon Lake	Duchesne Feeder Canal	Duchesne	Concrete weir, embankment wings	200	6	[1] 220	4,000	1939
Provo River	Murdock	Provo	Concrete weir, overflow, embankment wing.	5,000	10	100	9,036	1950
	Weber River	Weber	Concrete weir, embankment wings	1,000	10	1,795	15,400	1931
Strawberry Valley	Indian Creek Crossing	Indian Creek	Concrete weir	750	9	1,350	15,200	1913
	Spanish Fork	Spanish Fork	do	500	13	74	1,300	1908
Washington:								
Okanogan	Salmon Creek	Salmon Creek	Concrete weir, embankment wing	300	5	130	800	1909
Yakima	Easton [3]	Yakima	Concrete gravity, overflow, movable crest.	1,320	51	248	5,760	1929
	Prosser [10]	do	Concrete weir	(10)	6	768	1,026	[2] 1904
	Roza	do	Concrete weir, movable crest	2,200	34	486	21,711	1939
	Sunnyside	do	Concrete weir, embankment wing	1,320	6	[1] 500	1,809	1907
	Tieton	Tieton	do	320	2	510	1,368	1908
Wyoming:								
Riverton	Wind River	Wind River	do	2,200	19	2,464	123,860	1923
Shoshone	Corbett	Shoshone	Concrete slab-and-buttress weir, embankment wing.	1,000	12	938	10,200	1908
	Willwood	do	Concrete gravity, overflow, embankment wing.	320	41	476	22,119	1924

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[1] Overflow—length of overflow section only.

[2] Nonreclamation construction.

[3] Storage and diversion—dam classified according to its principal feature.

[4] Under construction.

[5] Nonreclamation construction. Rehabilitated by the Bureau of Reclamation in 1955.

[6] Reconstructed by the Bureau of Reclamation in 1954.

[7] Contributory dam—nonreclamation, furnishing water supply or power for irrigation of Bureau of Reclamation projects.

[8] Dam—indicates data applicable to dam only.

[9] Rehabilitated by the Bureau of Reclamation in 1953.

[10] Power dam—water supply for generation of power.

DEFINITIONS

Capacity: Second-feet of diversion provided by canal headworks at dam.

Height: Feet between original streambed and highest controlled water surface.

Length: Feet of barrier in dam and integral features constructed between natural abutments.

Volume: Cubic yards of all material in dam and its appurtenant features.

Year: Date original construction was completed.

DIVISION OF GENERAL ENGINEERING

The Division of General Engineering, formerly the office of the Assistant to the Commissioner—Engineering, was established in 1954 as a staff office in Washington, responsible for coordination and liaison activities on engineering matters requiring the attention of the Commissioner.

Throughout the 1955 fiscal year, coordination and liaison was maintained with the Department of Labor, the Renegotiation Board, General Accounting Office, and the Department on interpretation and clarification of regulations and policies relating to contract actions. Coordination of contract awards was provided in the Commissioner's office and departmental clearance obtained before award of contracts in excess of $10,000. Two staff members of the Division of General Engineering were designated as alternate members of the Department's Board of Contract Appeals and also to render technical advice and counsel to the Board.

An index-type escalator clause for inclusion in reclamation contracts was developed which is agreeable to the electric equipment industry and other governmental contracting agencies. As a result, index-type escalation clauses based on special indexes compiled and computed by Bureau of Labor Statistics are now available for use in contracts covering several categories of electrical equipment.

New procedures were established and instructions issued to insure compliance by reclamation contractors with the revised nondiscrimination provisions approved by Executive Order 10557, dated September 3, 1954. The Chief of the Division of General Engineering was designated compliance officer for the Bureau to carry out the objectives of the Executive order and maintain liaison with the Department's compliance officer and the President's Committee on Government Contracts.

Plans were formulated for the protection of Bureau structures and facilities under the national security program, and other civil defense work prepared in cooperation with the Department.

Liaison activities with other agencies resulted in the formation of a joint interagency committee for studying the land-subsidence problems in the San Joaquin Valley, Calif. As a result, the Geological Survey, the Coast and Geodetic Survey, Bureau of Mines, Bureau of Reclamation, State of California, Stanford University, and the University of California are cooperating in an investigation program.

DIVISION OF FOREIGN ACTIVITIES

During fiscal year 1955, the Bureau of Reclamation continued to cooperate in the technical-assistance programs of the United States Government, primarily at the request of the Foreign Operations Administration, which took over the work formerly performed by Technical Cooperation Administration and Mutual Security Agency.

The Division of Foreign Activities was established in December 1953 to administer the Bureau s participation in these programs formerly handled by a unit in the Commissioner's office. This assistance consisted of the training of technicians from foreign lands, rendering service to observers and visitors, sending of individual specialists and missions of Bureau technicians to other countries, and the performing at the Reclamation Engineering Center in Denver of technical services, such as testing, research, and design and specification review for foreign water resources development. Besides the work for the Foreign Operations Administration, the Bureau also handled a number of requests for assistance from the Department of State, UNRWA, IBRD, and other agencies directly concerned with water-resources development throughout the world. The Department of State requests were under the authority of Public Law 402 and financed by funds made available by the requesting government.

The Training Administration Branch handled 103 in-service trainees during fiscal year 1955, including engineers and government officials from 21 different countries. Also accommodated were 55 official observers and some 37 accredited visitors from 24 countries.

At the close of the fiscal year, there were 43 people on reclamation rolls on overseas assignments to Costa Rica, Egypt, Ethiopia, Formosa, India, Iran, Iraq, Israel, Lebanon, Pakistan, and Turkey.

During the year the Bureau of Reclamation received $2,726,480 from various agencies for financing these technical assistance and training programs, as compared to $2,329,000 for fiscal year 1953 and $2,438,000 for fiscal year 1954.

DIVISION OF IRRIGATION

The Division of Irrigation is responsible for supervising facilities capable of delivering irrigation water to more than 7 million acres of land, on which approximately 125,000 family-size farms and more than 125,000 suburban units have been developed. The area for which water can be supplied from Bureau-constructed works comprises about one-fourth of the total irrigated land area of the Western United

States. Approximately 1,600,000 persons, who are directly dependent on these reclamation developments, live in project towns and villages.

The Bureau of Reclamation also provides municipal and industrial water service from Bureau-constructed works to over 2,000,000 people.

In addition to water delivery, the Division of Irrigation is responsible, through proper supervision, for protection of the Federal investment in constructed works by keeping project facilities in repair to assure good service and the economical use of water. These facilities include 126 storage and 80 diversion dams, more than 19,500 miles of canals and laterals, over 5,700 miles of drains, 386 pumping plants, and an estimated 11,300 miles of operating roads.

Extension of Irrigaton Service

During 1954, Bureau-constructed facilities were extended to about 103,000 irrigable acres of new land within the service area of Reclamation projects. The bulk of this acreage comes from continued progress on the Columbia Basin project, in central Washington State, where facilities were completed to serve approximately 55,000 acres. Significant progress was made on new acreage development in Arizona, California, Idaho, Kansas, Nebraska, South Dakota, and Montana.

Of the above total, 72,018 acres represent land in private ownership on the Gila, Central Valley, and Columbia Basin projects, the Coachella division of the All-American Canal system, the Bostwick and Frenchman-Cambridge divisions, and the Angostura and Crow Creek pump units of the Missouri River Basin project. The remaining 30,056 acres embrace public land from units selected under the settlement program on the Gila, Minidoka, and Columbia Basin projects, and the Coachella division of the All-American Canal system.

Crop Production

The 1954 crop production on irrigated lands within the service area of Federal Reclamation projects was valued at $865,025,682. This is the second highest year in Reclamation history and is exceeded only by the record production of 1952. The value of crops harvested on Federal reclamation projects was $79.1 million greater than the previous year and only $70.7 million less than in 1952. Also, 1954 was the fourth consecutive year in which the total crop value exceeded the three-quarters-billion-dollar mark. increasing the cumulative value of all reclamation harvests through 1954 to about $10.6 billion.

Total crop production was divided into crop groups on the basis of utility as follows: Cereals, forage, miscellaneous field crops, seeds, vegetables, and fruits and nuts. In terms of acreage, the most significant crop group was forage, with 52 percent of the irrigated lands producing these crops. Cereal crops were the next most important group, followed by field crops, vegetables, fruits and nuts, and seeds, respectively.

In terms of crop value, the most significant crop group was miscellaneous field crops, with production being valued at $296.4 million. The next most important crop group was forage, followed by vegetables, fruits and nuts, cereals, and seeds. Data on crop production by crop groups follow:

Crop groups	Irrigated crops		Gross crop value	
	Acres	Percent of total	Total	Percent of total
Cereals	1, 540, 672	25	$99, 332, 553	12
Forage	3, 185, 677	52	145, 412, 993	17
Field crops, miscellaneous	1, 280, 641	21	296, 366, 120	34
Seeds	251, 790	4	29, 597, 126	3
Vegetables	443, 470	7	139, 188, 063	16
Fruits and nuts	254, 028	4	133, 981, 460	16
Soil building, idle, etc	119, 317	2	[1] 21, 147, 367	2
Total area reported	7, 075, 595	115		
Less residue and multiple crops	949, 829	15		
Total irrigated	6, 125, 766	100	865, 025, 682	100

[1] Additional revenues from Federal and commercial agencies.

Forage and cereal crops together, which largely are used locally as supplementary feed for livestock and hence are not in competition on the open market comprise a total of 4,726,349 acres of irrigated land, or over 77 percent of all irrigated lands on Federal Reclamation projects.

Over 700 million acres of rangeland are grazed annually in the Western States. This rangeland potential is seasonal in nature, and can be considered as a national asset only if livestock are available locally to graze these lands. Irrigation farming greatly enhances the value of this great asset by producing livestock feeds which are used during winter months to supplement summer grazing. Without irrigation, much of this great grazing potential would be lost because of prohibitive costs for shipment of cattle into and from these rangeland areas for the summer months.

Irrigated lands on the 69 Federal irrigation projects amounted to 6,125,766 acres in 1954. Significant changes in the irrigated acreage from 1953 occurred on projects where new irrigation development is presently being undertaken, and on projects located in drought areas which have experienced lower than normal precipitation in recent years.

Of the new lands brought within the service area of reclamation projects in 1954, over 65,000 acres were irrigated. The Columbia Basin project had an increase of 40,369 acres in irrigated acreage; Central Valley project, 12,484 acres; Minidoka project-North Side pumping division, 1,752 acres; the Missouri River Basin, 5,979 acres; the Coachella division of the All-American Canal system, 1,822 acres; and the Gila project, about 2,601 acres over 1953.

Projects in some drought areas were unable to furnish irrigation to as large an acreage in 1954, as was the case for 1953. Projects in region 5, which comprises Texas, Eastern New Mexico, Oklahoma, a portion of southern Colorado and Kansas were in this category, as well as other projects located east of the Continental Divide. The Rio Grande project had a decrease in the irrigated acreage of about 22,000 acres; Tucumcari project, 4,500 acres; Carlsbad project, 4,400 acres; North Platte project, 23,800 acres; and the Sun River project, 7,000. However, notwithstanding the fact that drought conditions prevailed in many sections throughout the west, irrigation on reclamation projects increased 28,151 acres over 1953.

Region 1 had a larger acreage of irrigated lands than any of the other regions within the Bureau, and also had the highest gross value of production. Data on irrigated lands and gross crop value are presented by regions as follows:

Regions	Irrigated lands		Gross crop value	
	Acres	Percent of total	Total	Percent of total
1	2, 166, 924	35	$252, 713, 495	29
2	846, 800	14	187, 328, 993	22
3	885, 983	15	221, 655, 156	26
4	556, 712	9	41, 600, 217	5
5	258, 163	4	55, 324, 918	6
6	444, 755	7	21, 118, 997	2
7	966, 429	16	85, 283, 906	10
Total	6, 125, 766	100	865, 025, 682	100

The average crop value per acre of irrigated land was $141.21, an increase over 1953 of over $12 per acre. The highest average value per acre for all production was attained on the Tieton division of the Yakima project which averaged $874.89 per irrigated acre in 1954. Fruit and nuts had the highest average value per acre of any of the crop groups ($527.43) and forage crops were lowest ($45.65).

The most significant individual crops produced on irrigated project lands from an acreage standpoint were alfalfa, pasture, barley, cotton, sugar beets, wheat, and dry and edible beans. However, from a value standpoint cotton was the most significant crop followed by alfalfa, sugar beets, potatoes, grapes, apples, and beans. These data are as follows:

Crops	Acres	Crop Value	
		Per Acre	Total
Barley	574, 770	$53. 38	$30, 681, 638
Wheat	401, 006	81. 68	32, 754, 864
Alfalfa hay	1, 483, 375	66. 78	99, 055, 993
Alfalfa seed	109, 406	110. 65	12, 105, 674
Pasture, improved	1, 029, 658	29. 93	30, 819 475
Sugar beets	378, 205	176. 85	66, 886, 432
Cotton [1]	513, 878	349. 82	179, 764, 548
Beans, dry	351, 230	96. 58	33, 922, 009
Potatoes	206, 395	266. 10	54, 922, 434
Tomatoes [2]	20, 317	667. 84	13, 568, 513
Lettuce	54, 552	396. 33	21, 620, 766
Sweet corn	32, 141	215. 41	6, 923, 392
Apples	36, 291	936. 07	33, 970, 853
Grapes [3]	82, 345	420. 50	34, 626, 082
Citrus fruit	43, 051	531. 73	22, 891, 990

[1] Includes value of cottonseed.
[2] Includes tomatoes for fresh market and canning.
[3] Includes grapes of all varieties.

Many foods which are used extensively throughout the country and which receive no price support assistance are produced only in the arid west on irrigated farms. The 17 Western States account for the entire production of almonds, apricots, filberts, walnuts, fresh market fall and winter peas, olives, prunes, mustard seed, dates, figs, raisins, honeyball and honeydew melons, and hops; and produce about 90 percent of the early spring asparagus, lettuce, early cantaloupes, winter spinach, spring onions, pears, sweet cherries, and grapes.

The acreage and value of crops produced on each of the Federal Reclamation projects are shown in tables 5 and 6.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calandar year 1954*

State, Project, and Subdivision	FULL SUPPLY PROJECTS [1]				SUPPLEMENTAL SUPPLY PROJECTS [2]			
	Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value	
			Total	Per Irrigated Acre			Total	Per Irrigated Acre
REGION 1								
Idaho	*Acres*	*Acres*			*Acres*	*Acres*		
Lewiston Orchards [4]	3, 523	2, 193	$682, 458	$311. 20				
Idaho-Oregon								
Boise:								
Big Bend irrigation district (Oregon)	1, 724	1, 492	117, 829	78. 97				
Black Canyon irrigation district, unit 1	6, 880	6, 370	897, 600	140. 91				
Black Canyon irrigation district, unit 2	51, 705	46, 947	2, 934, 098	62. 50				
Boise-Kuna irrigation district	48, 660	44, 934	3, 389, 305	75. 43				
Nampa and Meridian irrigation district	40, 196	35, 127	2, 520, 883	71, 76				
New York irrigation district	17, 826	14, 298	600, 251	41. 98				
Settlers irrigation district	518	0	0	0				
Wilder irrigation district	56, 558	51, 088	7, 507, 604	146. 95				
Special and Warren Act contractors								
Total, Boise project	224, 067	200. 256	17, 967, 570	89. 72				
Idaho-Washington								
Rathdrum Prairie:								
Hayden Lake unit [4]	1, 087	569	49, 096	86. 28				
Post Falls unit [4] [5]	3, 149	2, 705	240, 485	88. 90				
Total, Rathdrum Prairie project	4, 236	3, 274	289, 581	88. 45				
Idaho-Wyoming								
Minidoka:								
American Falls Reservoir district No. 2	98, 434	84, 505	6, 505, 622	76. 99				
Burley irrigation district	47, 937	43, 367	3, 871, 115	89. 26				
Fremont-Madison irrigation district					112, 000	102, 317	$9, 388, 884	$91. 76
Minidoka irrigation district	71, 882	64, 007	5, 651, 540	88. 30				
North Side pumping division	7, 289	6, 641	555, 937	83. 71				
Leased and water rental lands								
Special and Warren Act contractors								

Total, Minidoka project	225, 442	198, 520	16, 584, 214	83. 54	112, 000	102, 317	9, 388, 884	91. 76
Montana								
Bitter Root [4]	16, 665	16, 456	543, 106	33. 00				
Frenchtown	4, 810	3, 650	167, 823	45. 98				
Missoula Valley [5]	977	768	18, 080	23. 54				
Oregon								
Arnold [4]	4, 248	3, 091	307, 298	99. 42				
Baker					7, 312	7, 305	253, 300	34. 67
Burnt River					15, 230	15, 115	620, 210	41. 03
Deschutes:								
Central Oregon irrigation district [4]					46, 739	42, 328	4, 256, 205	100. 55
Lone Pine irrigation district								
North unit	50, 000	47, 887	7, 000, 383	146. 19				
Total, Deschutes project	50, 000	47, 887	7, 000, 383	146. 19	46, 739	42, 328	4, 256, 205	100. 55
Grants Pass [4]	10, 369	7, 226	826, 686	114. 40				
Ochoco [4]	8, 500	8, 233	765, 190	92. 94				
Umatilla:								
East division	10, 911	7, 017	345, 477	49. 23				
South division:								
Stanfield irrigation district [4]					6, 000	5, 129	611, 642	119. 25
Westland irrigation district					8, 196	5, 665	299, 973	52. 95
West division	7, 039	5, 576	371, 955	66. 71				
Total, Umatilla project	17, 950	12, 593	717, 432	56. 20	14, 196	10, 794	911, 615	84. 46
Vale	32, 000	31, 703	2, 125, 555	67. 05				
Oregon-Idaho								
Owyhee:								
Advancement irrigation district	700	579	93, 429	161. 36				
Bench irrigation district	2, 342	2, 164	564, 958	261. 07				
Crystal irrigation district	1, 280	1, 193	260, 451	218. 32				
Gem irrigation district (Idaho)	33, 454	32, 920	3, 352, 923	101. 85				
Ontario-Nyssa irrigation district	5, 831	5, 656	1, 132, 456	200. 22				
Owyhee irrigation district	49, 553	47, 566	4, 451, 563	93. 59				
Payette-Oregon Slope irrigation district	4, 676	4, 043	926, 397	229. 14				
Ridgeview irrigation district	6, 159	6, 059	628, 852	103. 79				
Slide irrigation district	1, 144	1, 097	162, 021	147. 69				
Special and Warren Act contractors								
Total, Owyhee project	105, 139	101, 277	11, 573, 050	114. 27				

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1954*—Continued

State, Project, and Subdivision	FULL SUPPLY PROJECTS[1]				SUPPLEMENTAL SUPPLY PROJECTS[2]			
	Irrigable Area for Service[3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service[3]	Irrigated Area	Gross Crop Value	
			Total	Per Irrigated Acre			Total	Per Irrigated Acre
REGION 1—continued								
Washington								
Columbia Basin:	*Acres*	*Acres*			*Acres*	*Acres*		
East Columbia Basin irrigation district	74, 737	43, 364	$8, 024, 216	$185. 04				
Quincy-Columbia Basin irrigation district	81, 346	47, 854	6, 873, 164	143. 63				
South Columbia Basin irrigation district	31, 610	13, 109	1, 355, 348	103. 39				
Total, Columbia Basin project	187, 693	104, 327	16, 252, 728	155. 79				
Okanogan	5, 334	3, 680	708, 507	192. 53				
Yakima:								
Kennewick division	4, 637	2, 386	523, 666	219. 47				
Kittitas division	59, 610	54, 221	2, 601, 658	47. 98				
Roza division	72, 241	65, 001	13, 329, 084	205. 06				
Sunnyside division	103, 309	79, 926	15, 345, 830	192. 00				
Tieton division	27, 271	24, 363	21, 314, 912	874. 89				
Special and Warren Act contractors								
Total, Yakima project	267, 068	225, 897	53, 115, 150	235. 13				
Total, region 1	1, 168, 121	971, 031	129, 644, 811	133. 51	195, 477	177, 859	$15, 430, 214	$86. 76
REGION 2								
California								
Central Valley[7]								
Orland	19, 422	17, 243	1, 510, 688	87. 61				
Oregon-California								
Klamath:								
Main division (Oregon)	[8] 39, 361	34, 007	4, 215, 831	123. 97				
Tule Lake division (California)	[9] 44, 430	43, 354	5, 323, 963	122. 80				
Special and Warren Act contractors								
Leased and water rental lands								
Total, Klamath project	83, 791	77, 361	9, 539, 794	123. 32				
Total, region 2	103, 213	94, 604	11, 050, 482	116. 81				

REGION 3								
Arizona								
Gila:								
Wellton-Mohawk division	40, 285	24, 637	5, 707, 153	231. 65				
Yuma Mesa division:								
North Gila unit	6, 424	6, 274	1, 589, 021	253. 27				
South Gila unit								
Yuma Mesa unit	19, 970	14, 211	1, 487, 436	104. 67				
Total, Gila project	66, 679	45, 122	8, 783, 610	194. 66				
Salt River	241, 322	192, 228	56, 639, 818	294. 65				
Yuma auxiliary	3, 305	2, 256	746, 404	330. 85				
Arizona-California								
Yuma:								
Reservation division:								
Bard unit (California)	6, 867	6, 246	1, 200, 226	192. 16				
Indian unit (California)	7, 743	4, 588	935, 965	204. 00				
Valley division (Arizona)	51, 936	45, 497	16, 043, 765	352. 63				
Total, Yuma project	66, 546	56, 331	18, 179, 956	322. 73				
California								
Boulder Canyon:								
All-American canal system								
Coachella division	74, 800	49, 192	24, 578, 044	499. 63				
Imperial division [7]								
Total, Boulder Canyon project	74, 800	49, 192	24, 578, 044	499. 63				
Total, region 3	452, 652	345, 129	108, 927, 832	315. 61				
REGION 4								
Colorado								
Fruitgrowers Dam [4]					2, 662	1, 850	304, 322	164. 50
Grand Valley:								
Garfield gravity division	22, 811	21, 197	1, 924, 705	90. 80				
Garfield pumping division	361	361	34, 115	94. 50				
Orchard Mesa division [4]	10, 027	8, 202	1, 684, 120	205. 33				
Special and Warren Act contractors								
Total, Grand Valley project	33, 199	29, 760	3, 642, 940	122. 41				
Mancos [5]					8, 601	7, 377	211, 746	28. 70
Paonia [4]	11, 500	8, 900	935, 839	105. 15				
Pine River					38, 728	32, 810	970, 722	29. 59
Pine River Indian irrigation					9, 875	8, 989	241, 983	26. 92
Uncompahgre	72, 743	57, 002	5, 077, 812	89. 08				

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1954*—Continued

State, Project, and Subdivision	FULL SUPPLY PROJECTS[1]				SUPPLEMENTAL SUPPLY PROJECTS[2]			
	Irrigable Area for Service[3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service[3]	Irrigated Area	Gross Crop Value	
			Total	Per Irrigated Acre			Total	Per Irrigated Acre
REGION 4—continued								
Idaho	*Acres*	*Acres*			*Acres*	*Acres*		
Preston Bench[4]					4, 500	3, 754	$319, 427	$85. 09
Nevada								
Humboldt					37, 446	29, 960	2, 109, 877	70. 42
Newlands:								
North Carson division	7, 558	4, 845	$262, 138	$54. 10				
South Carson division	55, 658	43, 632	2, 074, 493	47. 55				
Truckee division	7, 125	5, 499	262, 774	47. 79				
Total, Newlands project	70, 341	53, 976	2, 599, 405	48. 16				
Nevada-California								
Truckee storage					29, 200	22, 786	1, 726, 580	75. 77
Utah								
Hyrum					6, 800	5, 804	341, 388	58. 82
Moon Lake					75, 256	54, 054	1, 162, 602	21. 51
Newton[5]					2, 200	1, 969	111, 235	56. 49
Ogden River					22, 905	16, 165	1, 733, 500	107. 24
Provo River: Deer Creek division					46, 609	38, 792	4, 112, 728	106. 02
Sanpete:								
Ephraim division					7, 630	6, 733	293, 284	43. 56
Spring City division					6, 023	5, 320	208, 000	39. 10
Total, Sanpete project					13, 653	12, 053	501, 284	41. 59
Scofield[5]					15, 609	15, 009	921, 925	61. 42
Strawberry Valley:								
Highline division	17, 637	15, 661	844, 496	51. 94				
Spanish Fork division	13, 865	13, 342	943, 123	70. 69				
Springville-Mapleton division	8, 822	8, 104	568, 168	70. 11				
Total, Strawberry Valley project	40, 324	37, 107	2, 355, 787	63. 49				
Weber River					109, 037	90, 972	9, 707, 789	106. 71

Total, region 4	228, 107	186, 745	14, 611, 783	78. 21	423, 081	342, 344	24, 477, 108	71. 50
REGION 5								
New Mexico								
Carlsbad	25, 055	17, 534	3, 332, 807	190. 08				
Fort Sumner [4]	6, 500	5, 017	477, 863	95. 25				
Tucumcari	42, 214	29, 340	1, 764, 539	60. 14				
New Mexico-Texas								
Rio Grande: [10]								
Elephant Butte irrigation district (New Mexico)	102, 301	85, 834	25, 457, 529	296. 59				
El Paso County water improvement district No. 1 (Texas)	76, 014	56, 594	15, 905, 562	281. 05				
Hudspeth County conservation and reclamation district No. 1 (Texas)								
Total-Rio Grande project	178, 315	142, 428	41, 363, 091	290. 41				
Oklahoma								
W. C. Austin	47, 809	44, 552	5, 207, 243	116. 88				
Texas								
Balmorhea [5]					10, 608	7, 165	1, 424, 852	198. 86
Total, region 5	299, 893	238, 871	52, 145, 543	218. 30	10, 608	7, 165	1, 424, 852	198. 86
REGION 6								
Montana								
Buffalo Rapids:								
First division [5]	13, 903	12, 317	616, 807	50. 08				
Second division [5]	9, 422	8, 573	418, 139	48. 77				
Total Buffalo Rapids project	23, 325	20, 890	1, 034, 946	49. 54				
Huntley	32, 508	24, 229	1, 313, 735	54. 22				
Intake [5]	881	592	18, 890	31. 91				
Milk River:								
Chinook division	43, 484	25, 380	1, 249, 374	49. 23				
Dodson pumping unit [5]	1, 147	998	45, 960	46. 05				
Glasgow division	19, 407	12, 084	416, 525	34. 47				
Malta division	53, 733	24, 438	869, 203	35. 57				
Pump lands	6, 011	5, 331	274, 920	51. 57				
Total, Milk River project	123, 782	68, 231	2, 855, 982	41. 86				
Missouri River Basin: Yellowstone division: Savage unit	2, 215	2, 052	70, 178	34. 20				
Sun River:								
Fort Shaw division	11, 084	7, 652	208, 612	27. 26				
Greenfields division	84, 791	58, 874	2, 172, 769	36. 91				
Total, Sun River project	95, 875	66, 526	2, 381, 381	35. 80				

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1954*—Continued

State, Project, and Subdivision	FULL SUPPLY PROJECTS [1]				SUPPLEMENTAL SUPPLY PROJECTS [2]			
	Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value	
			Total	Per Irrigated Acre			Total	Per Irrigated Acre
REGION 6—continued								
Montana-North Dakota								
Lower Yellowstone:	*Acres*	*Acres*			*Acres*	*Acres*		
District No. 1 (Montana)	37, 272	32, 081	$1, 768, 515	$55. 13				
District No. 2 (North Dakota)	19, 928	16, 419	881, 560	53. 69				
Leased and water rental lands								
Total, Lower Yellowstone project	57, 200	48, 500	2, 650, 075	54. 64				
North Dakota								
Buford-Trenton [5]	10, 314	8, 964	347, 577	37. 77				
Missouri River Basin:								
Heart division:								
Dickinson unit								
Heart Butte unit								
North Dakota pumping division: Fort Clark unit	2, 039	364	15, 265	41. 94				
South Dakota								
Belle Fourche	57, 400	53, 102	2, 279, 005	42. 92				
Missouri River Basin: Cheyenne division: Angostura unit [5]	8, 386	7, 055	293, 017	41. 53				
Rapid Valley [5]					8, 900	6, 615	$201, 988	$30. 53
Wyoming								
Riverton:								
Midvale irrigation district	47, 222	44, 048	2, 077, 665	47. 17				
Third division	9, 012	6, 984	748, 338	107. 15				
Total, Riverton project	56, 234	51, 032	2, 826, 003	55. 38				

Wyoming-Montana								
Shoshone:								
Frannie division	20, 083	10, 771	371, 809	34. 52	----	----	----	----
Garland division	35, 950	32, 580	1, 934, 188	59. 37	----	----	----	----
Heart Mountain division	27, 978	22, 593	1, 297, 021	57. 41	----	----	----	----
Willwood division	11, 595	9, 914	620, 141	62. 55	----	----	----	----
Total, Shoshone project	95, 606	75, 858	4, 223, 159	55. 67	----	----	----	----
Totals—Region 6	565, 765	427, 395	20, 309, 213	47. 52	8, 900	6, 615	201, 988	30. 53
REGION 7								
Colorado								
Colorado-Big Thompson	----	----	----	----	615, 000	615, 000	54, 232, 322	88. 18
Nebraska								
Mirage Flats [5]	11, 657	11, 311	1, 207, 290	106. 74	----	----	----	----
Missouri River Basin:								
Bostwick division: Superior-Courtland unit	11, 464	7, 516	649, 158	86. 37	----	----	----	----
Frenchman-Cambridge division [4]	16, 200	8, 729	765, 338	87. 68	----	----	----	----
Nebraska-Wyoming								
North Platte:								
Gering-Fort Laramie irrigation district	54, 845	52, 610	5, 491, 991	104. 39	----	----	----	----
Goshen irrigation district (Wyoming)	52, 484	50, 217	4, 265, 593	84. 94	----	----	----	----
Northport irrigation district	16, 170	13, 073	758, 923	58. 05	----	----	----	----
Pathfinder irrigation district	[11] 102, 824	88, 679	6. 062, 462	68. 36	----	----	----	----
Special and Warren Act contractors (Nebraska)	----	----	----	----	----	----	----	----
Special and Warren Act contractors (Wyoming)	----	----	----	----	----	----	----	----
Leased and water rental lands	----	----	----	----	----	----	----	----
Total, North Platte project	226, 323	204, 579	16, 578, 969	81. 04	----	----	----	----
Wyoming								
Kendrick	22, 128	13, 168	541, 689	41. 14	----	----	----	----
Total, region 7	287, 772	245, 303	19, 742, 444	80. 48	615, 000	615, 000	54, 232, 322	88. 18
Total, all regions	3, 105, 523	2, 509, 078	356, 432, 108	142. 06	1, 253, 066	1, 148, 983	95, 766, 484	83. 35

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1954*—Continued

State, Project, and Subdivision	SPECIAL AND WARREN ACT CONTRACTORS				LEASED AND WATER RENTAL LANDS				TOTAL AREA			
	Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value	
			Total	Per Irrigated Acre			Total	Per Irrigated Acre			Total	Per Irrigated Acre
REGION I												
Idaho												
Lewiston Orchards [4]	*Acres*	*Acres*			*Acres*	*Acres*			*Acres* 3, 523	*Acres* 2, 193	$682, 458	$311. 20
Idaho-Oregon												
Boise:												
Big Bend irrigation district (Oregon)									1, 724	1, 492	117, 829	78. 97
Black Canyon irrigation district, unit 1									6, 880	6, 370	897, 600	140. 91
Black Canyon irrigation district, unit 2									51, 705	46, 947	2, 934, 098	62. 50
Boise-Kuna irrigation district									48, 660	44, 934	3, 389, 305	75. 43
Nampa and Meridian irrigation district									40, 196	35, 127	2, 520, 883	71. 76
New York irrigation district									17, 826	14, 298	600, 251	41. 98
Settlers irrigation district									518	0	0	0
Wilder irrigation district									56, 558	51, 088	7, 507, 604	146. 95
Special and Warren Act contractors	132, 841	123, 554	$12,483,081	$101. 03					132, 841	123, 554	12, 483, 081	101. 03
Total, Boise project	132, 841	123, 554	12, 483, 081	101. 03					356, 908	323, 810	30, 450, 651	94. 04
Idaho-Washington												
Rathdrum Prairie:												
Hayden Lake unit [4]									1, 087	569	49, 096	86. 28
Post Falls unit [4] [5]									3, 149	2, 705	240, 485	88. 90
Total, Rathdrum Prairie project									4, 236	3, 274	289, 581	88. 45
Idaho-Wyoming												
Minidoka:												
American Falls Reservoir district No. 2									98, 434	84, 505	6, 505, 622	76. 99
Burley irrigation district									47, 937	43, 367	3, 871, 115	89. 26
Fremont-Madison irrigation district									112, 000	102, 317	9, 388, 884	91. 76
Minidoka irrigation district									71, 882	64, 007	5, 651, 540	88. 30
North Side pumping division									7, 289	6, 641	555, 937	83. 71
Leased and water rental lands					1, 183	1, 183	$109, 695	$92. 73	1, 183	1, 183	109, 695	92. 73
Special and Warren Act contractors	747, 780	711, 688	55, 113, 078	77. 44					747, 780	711, 688	55, 113, 078	77. 44

Total, Minidoka project	747, 780	711, 688	55, 113, 078	77. 44	1, 183	1, 183	109, 695	92. 73	1, 086, 505	1, 013, 708	81, 195, 871	80. 10
Montana												
Bitter Root [4]									16, 665	16, 456	543, 106	33. 00
Frenchtown									4, 810	3, 650	167, 823	45. 98
Missoula Valley [5]									977	768	18, 080	23. 54
Oregon												
Arnold [4]									4, 248	3, 091	307, 298	99. 42
Baker									7, 312	7, 305	253, 300	34. 67
Burnt River									15, 230	15, 115	620, 210	41. 03
Deschutes:												
Central Oregon irrigation district [4]									46, 739	42, 328	4, 256, 205	100. 55
Lone Pine irrigation district	2, 520	2, 460	0	0					2, 520	2, 460	0	0
North unit					[6] 1, 614	1, 614	156, 977	97. 26	[6] 51, 614	49, 501	7, 157, 360	144. 59
Total, Deschutes project	2, 520	2, 460	0	0	[6] 1, 614	1, 614	156, 977	97. 26	[6] 100, 873	94, 289	11, 413, 565	121. 05
Grants Pass [4]									10, 369	7, 226	826, 686	114. 40
Ochoco [4]									8, 500	8, 233	765, 190	92. 94
Umatilla:												
East division									10, 911	7, 017	345, 477	49. 23
South division:												
Stanfield irrigation district [4]									6, 000	5, 129	611, 642	119. 25
Westland irrigation district									8, 196	5, 665	299, 973	52. 95
West division					530	499	95, 878	192. 14	7, 569	6, 075	467, 833	77. 01
Total, Umatilla project					530	499	95, 878	192. 14	32, 676	23, 886	1, 724, 925	72. 21
Vale									32, 000	31, 703	2, 125, 555	67. 05
Oregon-Idaho												
Owyhee:												
Advancement irrigation district									700	579	93, 429	161. 36
Bench irrigation district									2, 342	2, 164	564, 958	261. 07
Crystal irrigation district									1, 280	1, 193	260, 451	218. 32
Gem irrigation district (Idaho)									33, 454	32, 920	3, 352, 923	101. 85
Ontario-Nyssa irrigation district									5, 831	5, 656	1, 132, 456	200. 22
Owyhee irrigation district									49, 553	47, 566	4, 451, 563	93. 59
Payette-Oregon Slope irrigation district									4, 676	4, 043	926, 397	229. 14
Ridgeview irrigation district									6, 159	6, 059	628, 852	103. 79
Slide irrigation district									1, 144	1, 097	162, 021	147. 69
Special and Warren Act contractors	13, 800	12, 860	3, 257, 568	253. 31					13, 800	12, 860	3, 257, 568	253. 31
Total, Owyhee project	13, 800	12, 860	3, 257, 568	253. 31					118, 939	114, 137	14, 830, 618	129. 94

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1954*—Continued

State, Project, and Subdivision	SPECIAL AND WARREN ACT CONTRACTORS				LEASED AND WATER RENTAL LANDS				TOTAL AREA			
	Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value	
			Total	Per Irrigated Acre			Total	Per Irrigated Acre			Total	Per Irrigated Acre
REGION 1—CONTINUED												
Washington												
Columbia Basin:	*Acres*	*Acres*			*Acres*	*Acres*			*Acres*	*Acres*		
East Columbia Basin irrigation district									74, 737	43, 364	$8, 024, 216	$185. 04
Quincy-Columbia Basin irrigation district									81, 346	47, 854	6, 873, 164	143. 63
South Columbia Basin irrigation district									31, 610	13, 109	1, 355, 348	103. 39
Total, Columbia Basin project									187, 693	104, 327	16, 252, 728	155. 79
Okanogan									5, 334	3, 680	708, 507	192. 53
Yakima:												
Kennewick division									4, 637	2, 386	523, 666	219. 47
Kittitas division									59, 610	54, 221	2, 601, 658	47. 98
Roza division									72, 241	65, 001	13, 329, 084	205. 06
Sunnyside division					270	209	$40, 082	$191. 78	103, 579	80, 135	15, 385, 912	192. 00
Tieton division									27, 271	24, 363	21, 314, 912	874. 89
Special and Warren Act contractors	181, 761	163, 967	$36, 382, 111	$221. 89					181, 761	163, 967	36, 382, 111	221. 89
Total, Yakima project	181, 761	163, 967	36, 382, 111	221. 89	270	209	40, 082	191. 78	449, 099	390, 073	89, 537, 343	229. 54
Total, region 1	1, 078, 702	1, 014, 529	107, 235, 838	105. 70	3, 597	3, 505	402, 632	114. 87	2, 445, 897	2, 166, 924	252, 713, 495	116. 62
REGION 2												
California												
Central Valley [7]	806, 775	634, 258	166, 351, 321	262. 28					806, 775	634, 258	166, 351, 321	262. 28
Orland									19, 422	17, 243	1, 510, 688	87. 61
Oregon-California												
Klamath:												
Main division (Oregon)									[8] 39, 361	34, 007	4, 215, 831	123. 97
Tule Lake division (California)									[9] 44, 430	43, 354	5, 323, 963	122. 80
Special and Warren Act contractors	93, 569	86, 133	8, 116, 739	94. 23					93, 569	86, 133	8, 116, 739	94. 23
Leased and water rental lands					71, 923	31, 805	1, 810, 451	56. 92	71, 923	31, 805	1, 810, 451	5962.

Total, Klamath project	93, 569	86, 133	8, 116, 739	94. 23	71, 923	31, 805	1, 810, 451	56. 92	249, 283	195, 299	19, 466, 984	99. 68
Total, region 2	900, 344	720, 391	174, 468, 060	242. 19	71, 923	31, 805	1, 810, 451	56. 92	1, 075, 480	846, 800	187, 328, 993	221. 22
REGION 3												
Arizona												
Gila:												
Wellton-Mohawk division									40, 285	24, 637	5, 707, 153	231. 65
Yuma Mesa division:												
North Gila unit	924	622	68, 346	109. 88					7, 348	6, 896	1, 657, 367	240. 34
South Gila unit	846	845	123, 000	145. 56					846	845	123, 000	145. 56
Yuma Mesa unit									19, 970	14, 211	1, 487, 436	104. 67
Total, Gila project	1, 770	1, 467	191, 346	130. 43					68, 449	46, 589	8, 974, 956	192. 64
Salt River	95, 755	86, 882	21, 725, 400	250. 06					337, 077	279, 110	78, 365, 218	280. 77
Yuma auxiliary	117	114	28, 673	251. 52					3, 422	2, 370	775, 077	327. 04
Arizona-California												
Yuma:												
Reservation division:												
Bard unit (California)									6, 867	6, 246	1, 200, 226	192. 16
Indian unit (California)									7, 743	4, 588	935, 965	204. 00
Valley division (Arizona)									51, 936	45, 497	16, 043, 765	352. 63
Total, Yuma project									66, 546	56, 331	18, 179, 956	322. 73
California												
Boulder Canyon:												
All-American canal system												
Coachella division									74, 800	49, 192	24, 578, 044	499. 63
Imperial division [7]	530, 000	452, 391	90, 781, 905	200. 67					530, 000	452, 391	90, 781, 905	200. 67
Total, Boulder Canyon project	530, 000	452, 391	90, 781, 905	200. 67					604, 800	501, 583	115, 359, 949	229. 99
Total, region 3	627, 642	540, 854	112, 727, 324	208. 42					1, 080, 294	885, 983	221, 655, 156	250. 1
REGION 4												
Colorado												
Fruitgrowers Dam [4]									2, 662	1, 850	304, 322	164. 50
Grand Valley:												
Garfield gravity division					1, 421	73	6, 387	87. 49	24, 232	21, 270	1, 931, 092	90. 79
Garfield pumping division									361	361	34, 115	94. 50
Orchard Mesa division [4]									10, 027	8, 202	1, 684, 120	205. 33
Special and Warren Act contractors	9, 045	7, 730	1, 528, 805	197. 78					9, 045	7, 730	1, 528, 805	197. 78
Total, Grand Valley project	9, 045	7, 730	1, 528, 805	197 78	1, 421	73	6, 387	87. 49	43, 665	37, 563	5, 178, 132	137. 85

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1954*—Continued

State, Project, and Subdivision	SPECIAL AND WARREN ACT CONTRACTORS				LEASED AND WATER RENTAL LANDS				TOTAL AREA			
	Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value	
			Total	Per Irrigated Acre			Total	Per Irrigated Acre			Total	Per Irrigated Acre
REGION 4—continued												
Colorado—continued	*Acres*	*Acres*			*Acres*	*Acres*			*Acres*	*Acres*		
Mancos [5]									8,601	7,377	$211,746	$28.70
Paonia [4]									11,500	8,900	935,839	105.15
Pine River									38,728	32,810	970,722	29.59
Pine River Indian irrigation									9,875	8,989	241,983	26.92
Uncompahgre	15,913	15,524	$665,236	$42.85					88,656	72,526	5,743,048	79.19
Idaho												
Preston Bench [4]									4,500	3,754	319,427	85.09
Nevada												
Humboldt									37,446	29,960	2,109,877	70.42
Newlands:												
North Carson division									7,558	4,845	262,138	54.10
South Carson division									55,658	43,632	2,074,493	47.55
Truckee division									7,125	5,499	262,774	47.79
Total, Newlands project									70,341	53,976	2,599,405	48.16 K
Nevada-California												
Truckee storage									29,200	22,786	1,726,580	75.77
Utah												
Hyrum									6,800	5,804	341,388	58.82
Moon Lake									75,256	54,054	1,162,602	21.51
Newton [5]									2,200	1,969	111,235	56.49
Ogden River									22,905	16,165	1,733,500	107.24
Provo River: Deer Creek division									46,609	38,792	4,112,728	106.02
Sanpete:												
Ephraim division									7,630	6,733	293,284	43.56
Spring City division									6,023	5,320	208,000	39.10
Total, Sanpete project									13,653	12,053	501,284	41.59
Scofield [5]									15,609	15,009	921,925	61.42

Strawberry Valley:											
Highline division									17,637	15,661	844,496	51.94
Spanish Fork division	4,438	4,296	310,898	72.37					18,303	17,638	1,254,021	71.10
Springville-Mapleton division									8,822	8,104	568,168	70.11
Total, Strawberry Valley project	4,438	4,296	310,898	72.37					44,762	41,403	2,666,685	64.41
Weber River									109,037	90,972	9,707,789	106.71
Total, region 4	29,396	27,550	2,504,939	90.92	1,421	73	$6,387	$87.49	682,005	556,712	41,600,217	74.72
REGION 5												
New Mexico												
Carlsbad									25,055	17,534	3,332,807	190.08
Fort Sumner [4]									6,500	5,017	477,863	95.25
Tucumcari									42,214	29,340	1,764,539	60.14
New Mexico-Texas												
Rio Grande: [10]												
Elephant Butte irrigation district (New Mexico)									102,301	85,834	25,457,529	296.59
El Paso County water improvement district No. 1 (Texas)									76,014	56,594	15,905,562	281.05
Hudspeth County conservation and reclamation district No. 1 (Texas)	18,330	12,127	1,754,523	144.68					18,330	12,127	1,754,523	144.68
Total, Rio Grande project	18,330	12,127	1,754,523	144.68					196,645	154,555	43,117,614	278.98
Oklahoma												
W. C. Austin									47,809	44,552	5,207,243	116.88
Texas												
Balmorhea [5]									10,608	7,165	1,424,852	198.86
Total, region 5	18,330	12,127	1,754,523	144.68					328,831	258,163	55,324,918	214.30
REGION 6												
Montana												
Buffalo Rapids:												
First division [5]					1,359	1,359	42,647	31.38	15,262	13,676	659,454	48.22
Second division [5]					1,059	1,059	31,100	29.37	10,481	9,632	449,239	46.64
Total, Buffalo Rapids project					2,418	2,418	73,747	30.50	25,743	23,308	1,108,693	47.57
Huntley					620	620	44,848	72.34	33,128	24,849	1,358,583	54.67
Intake l									881	592	18,890	31.91

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1954*—Continued

State, Project, and Subdivision	SPECIAL AND WARREN ACT CONTRACTORS				LEASED AND WATER RENTAL LANDS				TOTAL AREA			
	Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value	
			Total	Per Irrigated Acre			Total	Per Irrigated Acre			Total	Per Irrigated Acre
REGION 6—continued												
Montana—continued												
Milk River:	*Acres*	*Acres*			*Acres*	*Acres*			*Acres*	*Acres*		
Chinook division									43, 484	25, 380	$1, 249, 374	$49. 23
Dodson pumping unit [5]									1, 147	998	45, 960	46. 05
Glasgow division									19, 407	12, 084	416, 525	34. 47
Malta division									53, 733	24, 438	869, 203	35. 57
Pump lands									6, 011	5, 331	274, 920	51. 57
Total, Milk River project									123, 782	68, 231	2, 855, 982	41. 86
Missouri River Basin: Yellowstone division:												
Savage unit									2, 215	2, 052	70, 178	34. 20
Sun River:												
Fort Shaw division					38	38	$1, 315	$34. 61	11, 122	7, 690	209, 927	27. 30
Greenfields division									84, 791	58, 874	2, 172, 769	36. 91
Total, Sun River project					38	38	1, 315	34. 61	95, 913	66, 564	2, 382, 696	35. 80
Montana-North Dakota												
Lower Yellowstone:												
District No. 1 (Montana)									37, 272	32, 081	1, 768, 515	55. 13
District No. 2 (North Dakota)									19, 928	16, 419	881, 560	53. 69
Leased and water rental lands					516	516	20, 427	39. 59	516	516	20, 427	39. 59
Total, Lower Yellowstone project					516	516	20, 427	39. 59	57, 716	49, 016	2, 670, 502	54. 48
North Dakota												
Buford-Trenton [5]									10, 314	8, 964	347, 577	37. 77
Missouri River Basin:												
Heart division:												
Dickinson unit					279	279	15, 293	54. 81	279	279	15, 293	54. 81
Heart Butte unit					105	105	7, 582	72. 21	105	105	7, 582	72. 21
North Dakota pumping division: Fort Clark unit					70	70	1, 049	14. 99	2, 109	434	16, 314	37. 59

South Dakota												
Belle Fourche					38	38	2, 579	67. 87	57, 438	53, 140	2, 281, 584	42. 94
Missouri River Basin: Cheyenne division:												
Angostura unit [5]					309	309	6, 384	20. 66	8, 695	7, 364	299, 401	40. 66
Rapid Valley [5]									8, 900	6, 615	201, 988	30. 53
Wyoming												
Riverton:												
Midvale irrigation district					1, 600	1, 600	57, 619	36. 01	48, 822	45, 648	2, 135, 284	46. 78
Third division					4, 752	4, 752	376, 953	79. 33	13, 764	11, 736	1, 125, 291	95. 88
Total, Riverton project					6, 352	6, 352	434, 572	68. 41	62, 586	57, 384	3, 260, 575	56. 82
Wyoming-Montana												
Shoshone:												
Fannie division									20, 083	10, 771	371, 809	34. 52
Garland division									35, 950	32, 580	1, 934, 188	59. 37
Heart Mountain division									27, 978	22, 593	1, 297, 021	57. 41
Willwood division									11, 595	9, 914	620, 141	62. 55
Total, Shoshone project									95, 606	75, 858	4, 223, 159	55. 67
Total—Region 6					10, 745	10, 745	607, 796	56. 57	585, 410	444, 755	21, 118, 997	47. 48
REGION 7												
Colorado												
Colorado-Big Thompson									615, 000	615, 000	54, 232, 322	88. 18
Nebraska												
Mirage Flats [5]									11, 657	11, 311	1, 207, 290	106. 74
Missouri River Basin:												
Bostwick division: Superior-Courtland unit									11, 464	7, 516	649, 158	86. 37
Frenchman-Cambridge division [4]									16, 200	8, 729	765, 338	87. 68
Nebraska-Wyoming												
North Platte:												
Gering-Fort Laramie irrigation district									54, 845	52, 610	5, 491, 991	104. 39
Goshen irrigation district (Wyoming)									52, 484	50, 217	4, 265, 593	84. 94
Northport irrigation district									16, 170	13, 073	758, 923	58. 05
Pathfinder irrigation district									[11] 102, 824	88, 679	6, 062, 462	68. 36
Special and Warren Act contractors (Nebraska)	92, 398	91, 213	$9, 879, 365	$108. 31					92, 398	91, 213	9, 879, 365	108. 31
Special and Warren Act contractors (Wyoming)	16, 317	14, 913	1, 429, 775	95. 87					16, 317	14, 913	1, 429, 775	95. 87
Leased and water rental lands					22, 366				22, 366			
Total, North Platte project	108, 715	106, 126	11, 309, 140	106. 56	22, 366				357, 404	310, 705	27, 888, 109	89. 76

See footnotes at end of table.

TABLE 5.—*Projects in operation—irrigation and crop value data for the calendar year 1954*—Continued

State, Project, and Subdivision	SPECIAL AND WARREN ACT CONTRACTORS				LEASED AND WATER RENTAL LANDS				TOTAL AREA			
	Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value		Irrigable Area for Service [3]	Irrigated Area	Gross Crop Value	
			Total	Per Irrigated Acre			Total	Per Irrigated Acre			Total	Per Irrigated Acre
REGION 7—continued												
Wyoming	*Acres*	*Acres*			*Acres*	*Acres*			*Acres*	*Acres*		
Kendrick									22, 128	13, 168	$541, 689	$41. 14
Total, region 7	108, 715	106, 126	$11, 309, 140	$106. 56	22, 366				1, 033, 853	966, 429	85, 283, 906	88. 25
Total, all regions	2, 763, 129	2, 421, 577	409, 999, 824	169. 31	110, 052	46, 128	$2.827,266	$61. 29	7, 231, 770	6, 125, 766	865, 025, 682	141. 21

SUMMARY

	Irrigable area for service [3]	Irrigated area	Gross crop value	
			Total	Per irrigated acre
	Acres	*Acres*		
Full supply projects	3, 105, 523	2, 509, 078	$356, 432, 108	$142. 06
Supplemental supply projects	1, 253, 066	1, 148, 983	95, 766, 484	83. 35
Special and Warren Act contractors	2, 763, 129	2, 421, 577	409, 999, 824	169. 31
Leased and water rental lands	110, 052	46, 128	2, 827, 266	61. 29
Grand total	7, 231, 770	6, 125, 766	865, 025, 682	141. 21
Grand total, 1953	7, 147, 528	6, 097, 615	785, 939, 868	126. 92
Increase, 1953–54 total	+84, 242	+28, 151	+79, 085, 814	+14. 29

[1] Projects receiving or to receive entire water supply from facilities constructed, rehabilitated or improved by the Bureau.

[2] Projects receiving or to receive only a partial water supply from Bureau facilities.

[3] Area for which the Bureau is prepared to supply water for irrigation. These lands contain a minor acreage of class 6 nonproductive land which is irrigated with excess water for a temporary period on an annual water rental basis.

[4] Private project reconstructed or rehabilitated with Government funds.

[5] Water conservation and utilization project.

[6] 1,614 acres of nonirrigable land irrigated with water from wasteways and water allotted to irrigable lands.

[7] Special contract.

[8] Of this irrigable area for service, 929 acres are in California and 38,432 acres are in Oregon.

[9] Of this irrigable area for service, 42,340 acres are in California and 2,090 acres are in Oregon.

[10] Irrigable area increased to include acreage not shown in earlier reports as follows: Elephant Butte irrigation district 11,661 acres of suspended land and 2,640 acres of class 1–4 land; El Paso County water improvement district No. 1, 7,004 acres of suspended land and 1,880 acres of class 1–4 land.

[11] Of this irrigable area for service 100,949 acres are in Nebraska and 1,875 acres are in Wyoming.

NOTE.—Per acre value based on irrigated area.

TABLE 6.—*Cumulative crop values, 1906–54*

Year	Federal irrigation projects [1]					Warren Act lands and special contractors					Entire area				
	Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value		Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value		Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value	
				For year	Cumulative total				For year	Cumulative total				For year	Cumulative total
1906	39, 300	[2] 22, 300	[2] 20, 100	[2] $244, 900							39, 300	[2] 22, 300	[2] 20, 100	[2] $244, 900	
1907	266, 300	[2] 187, 628	[2] 169, 000	[2] 4, 760, 460	$5, 005, 360						266, 300	[2] 187, 628	[2] 169, 000	[2] 4, 760, 460	$5, 005, 360
1908	488, 942	[2] 289, 549	[2] 260, 500	[2] 7, 635, 888	12, 641, 248						488, 942	[2] 289, 549	[2] 260, 500	[2] 7, 635, 888	12, 641, 248
1909	730, 601	410, 628	410, 628	11, 920, 663	24, 561, 911						730, 601	410, 628	410, 628	11, 920, 663	24, 561, 911
1910	917, 751	473, 423	473, 423	12, 974, 639	37, 536, 550						917, 751	473, 423	473, 423	12, 974, 639	37, 536, 550
1911	1, 042, 609	564, 681	564, 681	13, 121, 224	50, 657, 774						1, 042, 609	564, 681	564, 681	13, 121, 224	50, 657, 774
1912	1, 205, 236	618, 680	641, 397	14, 479, 368	65, 137, 142						1, 205, 236	618, 680	641, 397	14, 479, 368	65, 137, 142
1913	1, 255, 381	699, 183	642, 216	15, 732, 215	80, 869, 357						1, 255, 381	699, 183	642, 216	15, 732, 215	80, 869, 357
1914	1, 240, 875	761, 271	703, 424	16, 475, 517	97, 344, 874						1, 240, 875	761, 271	703, 424	16, 475, 517	97, 344, 874
1915	1, 472, 772	856, 778	757, 613	18, 164, 452	115, 509, 326						1, 472, 772	856, 778	757, 613	18, 164, 452	115, 509, 326
1916	1, 405, 452	922, 821	858, 291	32, 815, 972	148, 325, 298						1, 405, 452	922, 821	858, 291	32, 815, 972	148, 325, 298
1917	1, 599, 525	1, 057, 513	966, 784	56, 462, 313	204, 787, 611						1, 599, 525	1, 057, 513	966, 784	56, 462, 313	204, 787, 611
1918	1, 732, 374	1, 141, 516	1, 051, 193	66, 821, 396	271, 609, 007	951, 987	[2] 501, 100	[2] 481, 600	[2] 35, 000, 000		2, 684, 361	[2] 1, 642, 616	[2] 1, 532, 793	[2] 101, 821, 396	306, 609, 007
1919	1, 636, 159	1, 187, 255	1, 113, 469	88, 974, 137	360, 583, 144	1, 011, 815	916, 313	880, 613	64, 004, 750	$99, 004, 750	2. 647, 974	2, 103, 568	1, 994, 082	152, 978, 887	459, 587, 894
1920	1, 661, 960	1, 223, 480	1, 153, 820	66, 171, 650	426, 754, 794	1, 183, 292	981, 940	950, 890	47, 505, 770	146, 510, 520	2, 845, 252	2, 205, 420	2, 104, 710	113, 677, 420	573, 265, 314
1921	1, 674, 100	1, 227, 500	1, 157, 900	49, 620, 300	476, 375, 094	1, 146, 810	1, 001, 250	969, 550	44, 906, 130	191, 416, 650	2, 820, 910	2, 228, 750	2, 127, 450	94, 526, 430	667, 791, 744
1922	1, 692, 700	1, 202, 130	1, 169, 100	50, 360, 850	526, 735, 944	1, 101, 700	983, 290	951, 270	33, 240, 840	224, 657, 490	2, 794, 400	2, 185, 420	2, 120, 370	83, 601, 690	751, 393, 434
1923	1, 718, 400	1, 213, 700	1, 179, 870	65, 046, 300	591, 782, 244	1, 231, 400	1, 051, 380	993, 040	37, 557, 860	262, 215, 350	2, 949, 800	2, 265, 080	2, 172, 910	102, 604, 160	853, 997, 594
1924	1, 805, 730	1, 290, 890	1, 216, 610	66, 488, 560	658, 270, 804	1, 237, 885	930, 670	889, 460	43, 237, 470	305, 452, 820	3, 043, 615	2, 221, 560	2, 106, 070	109, 726, 030	963, 723, 624
1925	1, 802, 970	1, 320, 300	1, 242, 750	77, 608, 880	735, 879, 684	1, 340, 000	1, 019, 170	951, 250	53, 655, 850	359, 108, 670	3, 142, 970	2, 339, 470	2, 194, 000	131, 264, 730	1, 094, 988, 354
1926	1, 844, 550	1, 411, 020	1, 361, 470	60, 664, 900	796, 544, 584	1, 329, 020	1, 097, 190	949, 590	49, 750, 040	408, 858, 710	3, 173, 570	2, 508, 210	2, 311, 060	110, 414, 940	1, 205, 403, 294
1927	1, 956, 910	1, 378, 990	1, 431, 560	72, 047, 200	868, 591, 784	1, 482, 950	1, 148, 115	1, 072, 486	61, 160, 010	470, 018, 720	3, 439, 860	2, 527, 105	2, 504, 046	133, 207, 210	1, 338, 610, 504
1928	1, 882, 930	1, 442, 080	1, 489, 240	81, 077, 750	949, 669, 534	1, 490, 735	1, 235, 020	1, 192, 030	62, 495, 320	532, 514, 040	3, 373, 665	2, 677, 100	2, 681, 270	143, 573, 070	1, 482, 183, 574
1929	1, 922, 330	1, 483, 900	1, 512, 250	88, 459, 390	1, 038, 128, 924	1, 480, 040	1, 234, 230	1, 192, 990	72, 720, 490	605, 234, 530	3, 402, 370	2, 718, 130	2, 705, 240	161, 179, 880	1, 643, 363, 454
1930	1, 993, 390	1, 504, 810	1, 550, 967	65, 007, 270	1, 103, 136, 194	1, 640, 722	1, 286, 046	1, 254, 493	54, 654, 550	659, 889, 080	3, 634, 112	2, 790, 856	2, 805, 460	119, 661, 820	1, 763, 025, 274
1931	2, 027, 264	1, 552, 718	1, 520, 354	40, 554, 037	1, 143, 690, 231	1, 588, 972	1, 293, 889	1, 251, 830	33, 406, 340	693, 295, 420	3, 616, 236	2, 846, 607	2, 772, 184	73, 960, 377	1, 836, 985, 651
1932	2, 039, 074	1, 555, 144	1, 578, 880	31, 531, 162	1, 175, 221, 393	1, 512, 405	1, 214, 461	1, 196, 400	18, 627, 219	711, 922, 639	3, 551, 479	2, 769, 605	2, 775, 280	50, 158, 381	1, 887, 144, 032
1933	2, 025, 508	1, 589, 770	1, 598, 702	48, 765, 863	1, 223, 987, 256	1, 514, 201	1, 239, 017	1, 199, 113	35, 425, 870	747, 348, 509	3, 539, 709	2, 828, 787	2, 797, 815	84, 191, 733	1, 971, 335, 765
1934	1, 986, 268	1, 552, 124	1, 527, 104	60, 928, 969	1, 284, 916, 225	1, 508, 377	1, 285, 081	1, 229, 594	40, 014, 745	787, 363, 254	3, 494, 645	2, 837, 205	2, 756, 698	100, 943, 714	2, 072, 279, 479
1935	2, 113, 506	1, 640, 936	1, 604, 166	63, 601, 663	1, 348, 517, 888	1, 500, 589	1, 294, 680	1, 256, 970	43, 179, 631	830, 542, 885	3, 614, 095	2, 935, 616	2, 861, 136	106, 781, 294	2, 179, 060, 773
1936	2, 166, 409	1, 702, 192	1, 629, 174	78, 902, 818	1, 427, 420, 706	1, 527, 008	1, 335, 995	1, 272, 745	57, 599, 662	888, 142, 547	3, 693, 417	3, 038, 187	2, 901, 919	136, 502, 480	2, 315, 563, 253
1937	2, 194, 830	1, 725, 463	1, 700, 969	72, 893, 649	1, 500, 314, 355	1, 571, 382	1, 389, 338	1, 333, 800	45, 764, 623	933, 907, 170	3, 766, 212	3, 114, 801	3, 034, 769	118, 658, 272	2. 434, 221, 525
1938	2, 275, 882	1, 777, 584	1, 764, 363	67, 859, 804	1, 568, 174, 159	1, 507, 051	1, 329, 115	1, 276, 332	45, 603, 656	979, 510, 826	3, 782, 933	3, 106, 699	3, 040, 695	113, 463, 460	2, 547, 684, 985
1939	2, 492, 740	1, 922, 868	1, 903, 269	73, 769, 654	1, 641, 943, 813	1, 396, 800	1, 218, 108	1, 174, 803	40, 313, 140	1, 019, 823, 966	3, 889, 540	3, 140, 976	3, 078, 072	114, 082, 794	2, 661, 767, 779
1940	2, 780, 811	2, 152, 808	2, 138, 927	80, 098, 196	1, 722, 042, 009	1, 399, 057	1, 238, 262	1, 177, 103	37, 690, 481	1, 057, 514, 447	4, 179, 868	3, 391, 070	3, 316, 030	117, 788, 677	2, 779, 556, 456
1941	3, 547, 816	2, 199, 179	2, 178, 288	110, 399, 807	1, 832, 441, 816	1, 398, 338	1, 249, 204	1, 202, 172	49, 486, 191	1, 107, 000, 638	4, 946, 154	3, 448, 383	3, 380, 460	159, 885, 998	2, 939, 442, 454
1942	3, 487, 944	2, 688, 723	2, 615, 048	193, 783, 707	2, 026, 225, 523	1, 360, 757	1, 247, 512	1, 206, 651	78, 264, 809	1, 185, 265, 447	4, 848, 701	3, 936, 235	3, 821, 699	272, 048, 516	3, 211, 490, 970
1943	2, 957, 806	2, 422, 288	2, 398, 922	218, 064, 208	2, 244, 289, 731	1, 896, 026	1, 633, 041	1, 615, 424	170. 606, 761	1, 355, 872, 208	4, 853, 832	4, 055, 329	4, 014, 346	388, 670, 969	3, 600, 161, 939
1944	2, 970, 714	2, 468, 842	2, 475, 280	224, 683, 280	2, 468, 973, 011	1, 969, 281	1, 694, 069	1, 664, 861	186, 543, 084	1, 542, 415, 292	4, 939, 995	4, 163, 703	4, 139, 349	411, 226, 364	4, 011, 388, 303

1945	2, 975, 590	2, 416, 961	2, 464, 672	232, 545, 321	2, 701, 518, 332	2, 054, 746	1, 745, 627	1, 731, 060	202, 639, 074	1, 745, 054, 366	5, 030, 336	4, 162, 588	4, 195, 732	435, 184, 395	4, 446, 572, 698
1946	3, 079, 761	2, 513, 687	2, 567, 050	279, 711, 300	2, 981, 229, 632	2, 071, 070	1, 808, 282	1, 829, 531	250, 912, 645	1, 995, 967, 011	5, 150, 831	4, 321, 969	4, 396, 581	530, 623, 945	4, 977, 196, 643
1947	3, 091, 977	2, 629, 727	2, 683, 253	300, 474, 560	3, 281, 704, 192	2, 074, 806	1, 831, 975	1, 871, 099	254, 946, 244	2, 250, 913, 255	5, 166, 783	4, 461, 702	4, 554, 352	555, 420, 804	5, 532, 617, 447
1948	3, 221, 464	2, 664, 619	2, 760, 493	277, 160, 874	3, 558, 865, 066	2, 158, 551	1, 894, 136	1, 939, 241	257, 462, 667	2, 508, 375, 922	5, 380, 015	4, 558, 755	4, 699, 734	534, 623, 541	6, 067, 240, 988
1949	3, 296, 297	2, 792, 108	2, 848, 896	277, 347, 763	3, 836, 212, 829	2, 382, 215	2, 028, 481	2, 067, 338	238, 981, 245	2, 747, 357, 167	5, 678, 512	4, 820, 589	4, 916, 234	516, 329, 008	6, 583, 569, 996
1950	3, 398, 168	2, 857, 533	2, 918, 105	287, 683, 368	4, 123, 896, 197	2, 626, 342	2, 219, 653	2, 271, 358	290, 554, 341	3, 037, 911, 508	6, 024, 510	5, 077, 186	5, 189, 463	578, 237, 709	7, 161, 807, 705
1951	4, 049, 409	3, 596, 094	3, 624, 299	445, 407, 191	4, 569, 303, 388	2, 663, 606	2, 279, 675	2, 317, 714	376, 314, 474	3, 414, 225, 982	6, 713, 015	5, 875, 769	5, 942, 013	821, 721, 665	7, 983, 529, 370
1952	4, 264, 906	3, 643, 544	3, 681, 216	504, 544, 596	5, 073, 847, 984	2, 729, 572	2, 312, 206	2, 345, 138	431, 135, 159	3, 845, 361, 141	6, 994, 478	5, 955, 750	6, 026, 354	935, 679, 755	8, 919, 209, 125
1953	4, 354, 911	3, 728, 218	3, 784, 963	417, 790, 763	5, 491, 638, 747	2, 792, 617	2, 369, 397	2, 407, 453	368, 149, 105	4, 213, 510, 246	7, 147, 528	6, 097, 615	6, 192, 416	785, 939, 868	9, 705, 148, 993
1954	4, 468, 641	3, 704, 189	3, 757, 365	455, 025, 858	5, 946, 664, 605	2, 763, 129	2, 421, 577	2, 437, 766	409, 999, 824	4, 623, 510, 070	7, 231, 770	6, 125, 766	6, 195, 131	865, 025, 682	10, 570, 174, 675

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[1] Includes projects constructed by the United States and those for which supplemental water is furnished from storage works built by the United States.

[2] Estimated.

Land Openings

During fiscal year 1955, the Bureau conducted 4 land openings on 2 reclamation projects, making 243 farm units embracing 23,514 irrigable acres of new land available for settlement.

As in previous years, the majority of these units was on the Columbia Basin project in Washington where 149 units were offered for sale under provisions of the Columbia Basin Project Act. The remaining 94 units were opened for settlement under provisions of reclamation and homestead laws in the Northside pumping unit of the Minidoka project in Idaho. Public response to the announced availability of new farm units under the Bureau's settlement program continued at the high level evidenced since the close of World War II, with an average of nearly 100 qualified applicants for each unit offered.

Since the close of World War II, 48 land openings have been held on 13 reclamation projects. A total of 2,166 new farm units encompassing nearly 183,000 irrigable acres of public land has thus been made available for selection by qualified applicants.

Both technical and financial assistance has continued to be available to settlers during developmental years through cooperative working relationships established by the Bureau with the Farmers Home Administration, the Agricultural Extension Service, the several State colleges and universities, and other similarly appropriate agencies.

During fiscal year 1956 the availability of additional new farm units is anticipated on the Columbia Basin and Yakima projects in Washington, the Minidoka project in Idaho, and the Gila project in Arizona.

Development Farms

The development farm program on new irrigation projects was begun in 1947 and has been continued in cooperation with Department of Agriculture agencies and State agricultural colleges.

The purpose of the farms is to demonstrate effective methods of irrigation and good cropping practices; to determine crops best adapted to the area, and water requirements of the crops; and to demonstrate other approved practices with which the new settlers may have had little or no experience. The farms also aid in determining the feasibility of developing certain areas for irrigation where the quality of the soil and water may be questionable.

From 10 to 20 percent of most farms are set aside for research by the cooperating agencies on special problems which may be encountered in the area. Field days, tours, and other educational media are employed to disseminate the information obtained from the research and to explain the demonstrations to the farmers on the project. Over 22,000 local settlers and others interested in the work have visited the farms.

New settlers have been aided materially through the development farm program in making an early success of their irrigated farms, which in turn has helped safeguard the Government's investment in the construction of irrigation projects.

To date 23 development farms have been established of which 7 have served their purpose and have been discontinued. It is expected that 2 or 3 of the presently operated farms will be discontinued at the end of the 1955 operating season. Plans have been made to establish about 4 new farms next fiscal year. The present farms are located in the Columbia Basin, Missouri River Basin, and Gila projects.

Repayment and Water Service Contracts

During fiscal year 1955 contracts were executed with nine irrigation districts for the repayment of the cost of new irrigation works. Twenty-six water users' organizations signed contracts for the purchase of storage water rights or for interim and long-term water service. Pursuant to special authorizing legislation, basic amendatory construction repayment contracts were executed with 8 irrigation districts. Negotiations of basic amendatory construction repayment contracts are under way or scheduled with 5 irrigation districts. These contracts will require special congressional authorization. Amendatory contracts were executed with an additional 20 organizations to provide for such matters as the transfer of operation and maintenance of the irrigation works to the water users and the repayment of the cost of rehabilitation and betterment programs.

Soil and Moisture Conservation Operations

The Bureau of Reclamation has continued its soil and moisture conservation program in keeping with the Department's policy of conserving the natural resources on lands under its jurisdiction.

The program objectives are accomplished in cooperation with other Federal agencies as well as State and local agencies. Water users' organizations assist in planning the work and in many cases furnish a part of the labor, materials, and funds.

The activities have included erosion control and water conservation on acquired and withdrawn lands, protection of reservoirs and other irrigation facilities, and general betterment of the lands in the Bureau's custody. Some of the particular work undertaken during this year included reseeding watershed areas, sand dune control, salt cedar control investigations, soil stabilization and stream control.

Drainage

Drainage for the disposal of surplus ground water is, of necessity, an integral part of an irrigation system. It has been found, however, that it is not fully possible to predict the nature of a drainage problem prior to its actual occurrence on a project.

Hence, drainage problems fall into three stages of project development: First, the initial stages of project operation during which ground-water accumulations must be studied by analysis of systematically collected data on project ground-water elevations; second, a stage in which ground-water elevations adversely affect crop production and drains or wells must be constructed to remove surplus water; and third, a period of maintenance and minor extension of drainage to new problem areas.

There are Bureau of Reclamation projects in all of these stages but it is possible to report that during fiscal year 1955 there was no case of drainage problems being of great magnitude. Ground-water elevations were being studied on new projects, particularly those in the Missouri River Basin project where problems are expected. There were no major drains under construction during the year. Regular maintenance of drains continued, with trouble from erosion being experienced in a few places.

The Bureau recognizes that prevention of ground-water accumulation would eliminate drainage problems. Hence, many canals and laterals have been lined to prevent seepage. In some areas, particularly on the North Platte project in Nebraska, lining has been so effective that it has been possible to abandon drains or to refill the drains and place the land in cultivation.

The Bureau also has a continuing program of education of water users in the proper use of water to the end that waste and overirrigation will be reduced with a consequent reduction in drainage problems.

Weed Control

During the past year, continued progress was made in developing and applying more economical methods of weed control.

Of particular importance in this field is the research being conducted in cooperation with the Weed Investigations Section, Agricultural Research Service, Department of Agriculture. This research is undertaken at four field stations established in the West by that Department with locations at Phoenix, Ariz.; Prosser, Wash.; Logan, Utah; and Bozeman, Mont.

In the Bureau's Denver laboratories special attention has been given to developing better methods for controlling salt cedar, submersed waterweeds, and algae. The use of radioactive isotopes in tracing the movement and concentration of herbicides in plant tissues also has been continued in Denver.

Both Federal and private irrigation districts have been kept advised of the new developments in weed control through motion pictures, slide lectures, Reclamation Era articles, handbooks, and other educational media prepared by the Bureau or prepared in cooperation with other agencies.

Cooperation With Other Agencies

The Bureau of Reclamation has worked closely during the fiscal year with units in the Department of Agriculture, the State colleges and extension services, and other Federal, State, and local agencies.

Many phases of the Bureau's activities in planning, developing, and operating irrigation projects in the 17 Western States lend themselves to such cooperation. The cooperative undertakings with these agencies have been carried out through memorandums of understanding or cooperative agreements.

Of the 158 agreements now in effect, 33 were executed during the past fiscal year.

Public Use of Reservoirs

Construction of dams and reservoirs for irrigation and power development provides incidental but very definite benefits through the creation of exceptional public use opportunities. This is particularly true in the more arid parts of the West.

However, except as provided by law in specific instances, the Bureau of Reclamation is not authorized to expend funds for development of reservoir areas for public uses.

At certain reservoirs where possibilities for use by the public are deemed to be of national significance, such as Lake Mead, on the Colorado River between Arizona and Nevada; Franklin D. Roosevelt Lake, on the Columbia River in Washington; Millerton Lake on the San Joaquin River in California; and Shadow Mountain Lake and Lake Granby on the Colorado River in Colorado, responsibility for the development and administration of public use facilities has been delegated to the National Park Service.

The National Park Service is, in effect, the agent of the Bureau in all public use matters and negotiates for the development and administration, by local or State governmental agencies, of reservoir areas which are of local or State significance. Facilities at reservoirs wholly or substantially within national forest boundaries are administered by the United States Forest Service.

Federal Tax Revenues and Reclamation

Each step taken in the development of the Nation's basic resources moves the economy of the Nation to a new and higher plateau. This is strikingly demonstrated in an analysis of Federal tax revenues from Federal reclamation project areas.

Based on the projected results of a sample study of 15 reclamation projects, the estimated cumulative return to the Treasury from the 73 projects or divisions of projects receiving water under the Federal reclamation program in 1954 now stands at approximately $4 billion. This is an amount greater than total reclamation expenditures for all project works since the beginning of the Federal reclamation program in 1902.

The benefits accruing to the Nation through reclamation development are also measured in terms of families served, crop production and value, livestock raised, and acres irrigated. They are expressed in rapidly expanding trade and business activity, in direct repayment to the Government by the beneficiaries of reclamation, in increased population on and adjacent to projects, and in a wide variety of other phenomena.

These are all tangible, measurable benefits of a broad and lasting nature. They translate into expanding business activities in the project and surrounding areas. They filter to every State in the Union and every segment of society. They provide through this process additional economic stability to the Nation, which is reflected in part by increased revenues to the Treasury, and to the States and areas as well as on the projects themselves.

The estimate of Federal tax revenues from reclamation project areas is, therefore, only a partial measure of the true contribution of basic reclamation resource development to the Nation's tax structure and to the economy as a whole.

In 1954, individual income taxes paid directly by irrigation farmers and by persons of the neighboring towns and villages whose business or employment was affected by the construction of 15 selected reclamation projects were estimated at $106 million. The aggregate individual income tax revenues from this sample study area since income tax collections started in 1916 is estimated at over $900 million.

In addition to individual tax revenues, an appropriate share of corporation and excise tax revenues collected in the same 15 project areas is directly attributable to reclamation development. Estimated receipts from these sources total nearly $500 million. The combined returns from individual and corporate tax revenues accordingly are estimated at $1.4 billion.

Total Federal project construction cost through June 30, 1954, for the same projects aggregated $273 million. Thus far, Federal tax revenues from these 15 project areas total more than 5 times the total cost of project facilities and about 7½ times the direct cost of irrigation facilities.

DIVISION OF POWER

The installed capacity and the generation of hydroelectric power from Bureau of Reclamation multipurpose projects and from projects for which the Bureau is responsible for marketing the power, increased 324,600 kilowatts during fiscal year 1955. On June 30, 1955, the installed capacity of powerplants constructed and operated by the Bureau of Reclamation totaled 4,854,550 kilowatts whereas the capacity installed and operated by other agencies for which the Bureau is the marketing agent totaled 356,500 kilowatts.

Sale of electric power during the year aggregated 25,031,325,608 kilowatt-hours, with revenues from sales totaling $51,764,256.48, as shown in table 7. This compares to the previous year's sales of 25,071,363,414 kilowatt-hours, and revenues of $50,812,260.06.

Present Installed Capacity

During the fiscal year ending June 30, 1955, the Bureau of Reclamation operated 34 powerplants with a total nameplate capacity of 4,854,550 kilowatts, an increase of 133,100 kilowatts over the fiscal year 1954 figures. In addition, the Bureau marketed the power generated from plants constructed by the Corps of Engineers and the International Boundary Water Commission, totaling 356,500 kilowatts.

The capacity installed during fiscal year 1955 is as follows:

	Kilowatts
Bureau of Reclamation:	
Central Valley project	67, 500
Kendrick project	36, 000
Eklutna project	32, 000
Yakima project (Prosser powerplant retired)	—2, 400
	133, 100
U. S. Corps of Engineers: Missouri River Basin project Fort Randall	160, 000
International Boundary Water Commission: Falcon Dam	31, 500
Total	324, 600

Additional Capacity Under Construction

At the end of fiscal year 1955, the Bureau of Reclamation had under construction 4 powerplants, which will have an ultimate installed nameplate capacity of 198,000 kilowatts. They are: Palisades, on the Snake River in Idaho; Chandler, Yakima River, Wash.; Fremont Canyon and Glendo, both on the North Platte River in Wyoming.

The United States Army Corps of Engineers is proceeding with the construction of its plants on the Missouri River Basin project. The ultimate nameplate capacity of the 3 plants—Garrison, in North Dakota; and Gavins Point and Oahe, in South Dakota—under construction by the corps will total 925,000 kilowatts. The Bureau of Reclamation will be the marketing agent for energy generated from these plants as in the case for other plants constructed by the Corps on the Missouri River Basin project.

TABLE 7.—*Bureau of Reclamation power systems, power sales, and revenues by projects, fiscal year ending June 30, 1955* [1]

Projects	Sales of electric energy, kilowatt-hours	Revenues from sales
Boise project	152, 926, 558	$295, 431. 32
Columbia Basin project [2]	14, 224, 966, 000	12, 651, 264. 59
Minidoka project	139, 614. 733	583, 458. 07
Yakima project	23, 082, 435	58, 372. 53
Hungry Horse project [3]	958, 839, 110	3, 620, 620. 73
Central Valley project	2, 058, 810, 064	8, 120, 810. 14
Boulder Canyon project	3, 533, 591, 876	8, 342, 320. 08
Parker-Davis project	1, 421, 474, 140	5, 646, 965. 76
Yuma project	6, 567, 642	20, 601. 22
Rio Grande project	90, 921, 175	633, 862. 40
Falcon Dam project	92, 261, 200	249, 105. 25
Fort Peck project	485, 136, 548	2, 005, 251. 08
North Platte project	66, 867, 824	452, 191. 59
Missouri River Basin—Western Division, including systems of Riverton, Shoshone, Colorado-Big Thompson, and Kendrick projects	944, 268, 024	5, 890, 997. 87
Missouri River Basin, eastern division	789, 590, 196	2, 773, 147. 94
Eklutna project, Alaska	42, 408, 083	419, 855. 91
Grand total	25, 031, 325, 608	51, 764, 256. 48

[1] Does not include energy sales and revenues in transactions between Bureau projects.

[2] Totals include 13,617,296,841 kilowatt-hours delivered to Bonneville Power Administration for marketing and $12,347,430 in payments by that agency not including river regulation benefits.

[3] Totals include 956,270,860 kilowatt-hours delivered to Bonneville Power Administration for marketing and $3,609,000 in payments by that agency.

Authorized To Be Constructed

Authorized but not yet under construction by the Bureau of Reclamation as a part of multipurpose Reclamation facilities are 31 powerplants with an ultimate total nameplate capacity of 1,037,350 kilowatts.

The status of hydroelectric powerplants on reclamation projects is shown in table 8.

TABLE 8.—*U. S. Department of the Interior, Bureal of Reclamation, hydroelectric power plants*

A. CONSTRUCTED AND OPERATED BY BUREAU OF RECLAMATION

State	Project	Name of plant	Calender year of initial operation	Nameplate capacity		Number and nameplate capacity of generators	
				Existing (kilowatts)	Ultimate (kilowatts)	Existing (kilowatts)	Ultimate (kilowatts)
1. Alaska	Eklutna	Eklutna	1955	30,000	30,000	2-15,000	2-15,000.
2. Alaska	do	Little Eklutna [1]	1955	2,000	2,000	2-1,000	2-1,000.
3. Arizona-Nevada	Boulder Canyon	Hoover [2]	1936	1,249,800	1,354,300	14-82,500; 1-40,000; 2-2,400 1-50,000	14-82,500; 1-40,000; 2-2,400. 1-50,000; 1-104,500.
4. Arizona-Nevada	Parker-Davis	Davis	1951	225,000	225,000	5-45,000	5-45,000.
5. Arizona-Nevada	do	Parker	1942	120,000	120,000	4-30,000	4-30,000.
6. California	Central Valley	Folsom	1955	54,000	162,000	1-54,000	3-54,000.
7. California	do	Keswick	1949	75,000	75,000	3-25,000	3-25,000.
8. California	do	Nimbus	1955	13,500	13,500	2-6,750	2-6,750.
9. California	do	Shasta	1944	379,000	379,000	5-75,000; 2-2,000	5-75,000; 2-2,000.
10. California	Yuma	Siphon Drop	1926	1,600	1,600	2-800	2-800.
11. Colorado	Colorado-Big Thompson	Estes	1950	45,000	45,000	3-15,000	3-15,000.
12. Colorado	do	Flatiron	1954	71,500	71,500	2-31,500; 1-8,500	2-31,500; 1-8,500.
13. Colorado	do	Green Mountain	1943	21,600	21,600	2-10,800	2-10,800.
14. Colorado	do	Marys Lake	1951	8,100	8,100	1-8,100	1-8,100.
15. Colorado	do	Polehill	1954	33,250	33,250	1-33,250	1-33, 250.
16. Colorado	Grand Valley	Grand Valley [3]	1932	3,000	3,000	2-1,500	2-1,500.
17. Idaho	Boise	Anderson Ranch	1950	27,000	40,500	2-13,500	3-13,500.
18. Idaho	do	Black Canyon	1925	8,000	8,000	2-4,000	2-4,000.
19. Idaho	do	Boise Diversion	1912	1,500	1,500	3-500	3-500.
20. Idaho	Minidoka	Minidoka	1909	13,400	13,400	1-5,000; 1-2,400; 5-1,200	1-5,000; 1-2,400; 5-1,200.
21. Montana	Missouri River Basin	Canyon Ferry	1953	50,000	50,000	3-16,667	3-16,667.
22. Montana	Hungry Horse	Hungry Horse	1952	285,000	285,000	4-71,250	4-71, 250.
23. New Mexico	Rio Grande	Elephant Butte	1940	24,300	24,300	3-8,100	3-8, 100.
24. South Dakota	Missouri River Basin	Angostura	1951	1,200	1,200	1-1,200	1-1,200.
25. Washington	Columbia Basin	Grand Coulee	1941	1,974,000	1,974,000	18-108,000; 3-10,000	18-108,000; 3-10,000.
26. Wyoming	Kendrick	Alcova	1955	36,000	36,000	2-18,000	2-18,000.
27. Wyoming	do	Seminoe	1939	32,400	32,400	3-10,800	3-10,800.
28. Wyoming	Missouri River Basin	Boysen	1952	15,000	15,000	2-7,500	2-7,500.
29. Wyoming	do	Kortes	1950	36,000	36,000	3-12,000	3-12,000.
30. Wyoming	North Platte	Guernsey	1927	4,800	4,800	2-2,400	2-2,400.
31. Wyoming	do	Lingle	1919	1,400	1,400	2-400; 2-300	2-400; 2-300.
32. Wyoming	Riverton	Pilot Butte	1925	1,600	1,600	2-800	2-800.
33. Wyoming	Shoshone	Heart Mountain	1948	5,000	5,000	1-5,000	1-5,000.
34. Wyoming	do	Shoshone	1922	5,600	5,600	1-4,000; 2-800	1-4,000; 2-800.
Subtotal A				4,854,550	5,080,550		

See footnotes at end of table.

TABLE 8.—*U. S. Department of the Interior, Bureau of Reclamation, hydroelectric power plants*—Continued

State	Project	Name of plant	Calender year of initial operation	Nameplate capacity		Number and nameplate capacity of generators	
				Existing (kilowatts)	Ultimate (kilowatts)	Existing (kilowatts)	Ultimate (kilowatts)
B. CONSTRUCTED AND OPERATED BY OTHERS—POWER MARKETED BY BUREAU OF RECLAMATION							
1. Montana	Fort Peck (USCE)	Fort Peck	1943	85, 000	165, 000	2–35,000; 1–15,000	2–35,000; 2–40,000; 1–15,000.
2. South Dakota	Missouri River Basin (USCE)	Fort Randall	1954	240, 000	320, 000	6–40,000	8–40,000.
3. Texas	Falcon Dam (IBWC)	Falcon	1954	31, 500	31, 500	3–10,500	3–10,500.
Subtotal B				356, 500	516, 500		
C. UNDER CONSTRUCTION BY BUREAU OF RECLAMATION							
1. Idaho	Palisades	Palisades	1956	0	114, 000	0	4–28, 500.
2. Washington	Yakima-Kennewick	Chandler	1955	0	12, 000	0	2–6, 000.
3. Wyoming	Missouri River Basin	Fremont Canyon	1961	0	48, 000	0	2–24, 000.
4. Wyoming	do	Glendo	1959	0	24, 000	0	2–12, 000.
Subtotal C				0	198, 000		
D. UNDER CONSTRUCTION BY OTHERS—POWER TO BE MARKETED BY BUREAU OF RECLAMATION							
1. North Dakota	Missouri River Basin (USCE)	Garrison	1955	0	400, 000	0	5–80, 000.
2. South Dakota	do	Gavins Point	1956	0	100, 000	0	3–33, 333.
3. South Dakota	do	Oahe	1961	0	425, 000	0	5–85, 000.
Subtotal D				0	925, 000		

E. AUTHORIZED TO BE CONSTRUCTED BY BUREAU OF RECLAMATION

1. California	Central Valley	Lewiston	1961	0	2, 000	0	1–2, 000.
2. California	do	Matheson	1961	0	75, 000	0	3–25, 000.
3. California	do	Tower House	1961	0	66, 000	0	3–22, 000.
4. California	do	Trinity	1963	0	90, 000	0	4–22, 500.
5. Colorado	Collbran	Molina	1959	0	5, 500	0	1–5, 500.
6. Colorado	do	Cameo	1960	0	2, 500	0	1–2, 500.
7. Colorado	Colorado-Big Thompson	Big Thompson	1958	0	4, 500	0	1–4, 500.
8. Idaho	Minidoka	American Falls	1959	0	30, 000	0	3–10, 000.
9. Montana	Missouri River Basin	Absaroka	1970	0	50, 000	0	3–16, 667.
10. Montana	do	Kenil	1970	0	1, 600	0	2–800.
11. Montana	do	Little Porcupine	1970	0	18, 000	0	3–6, 000.
12. Montana	do	Lyon	1963	0	24, 000	0	3–8, 000.
13. Montana	do	Moorhead	1970	0	8, 000	0	2–4, 000.
14. Montana	do	Portage	1965	0	20, 000	0	2–10, 000.
15. Montana	do	Tiber	1958	0	2, 000	0	3–667.
16. Montana	do	Yellowtail	1961	0	200, 000	0	4–50, 000.
17. Nebraska	do	Davis Creek No. 1	1965	0	2, 600	0	1–2, 600.
18. Nebraska	do	Davis Creek No. 2	1966	0	11, 000	0	2–5, 500.
19. Nebraska	do	Lees Park	1967	0	6, 100	0	1–6, 100.
20. Nebraska	do	Lillian	1966	0	4, 400	0	2–2, 200.
21. Oregon	Talent	Green Springs		0	10, 000	0	2–5, 000.
22. South Dakota	Missouri River Basin	Pony Hills	1966	0	180, 000	0	4–45, 000.
23. Utah	Weber Basin	Gateway	1957	0	4, 000	0	2–2, 000.
24. Utah	do	Wanship	1957	0	1, 400	0	1–1, 400.
25. Utah	Provo River Basin	Deer Creek	1957	0	5, 000	0	2–2, 500.
26. Washington	Yakima-Roza division	Roza	1958	0	11, 250	0	2–5, 625.
27. Wyoming	Missouri River Basin	Bald Ridge	1963	0	23, 000	0	3–7, 667.
28. Wyoming	do	Hunter Mountain	1964	0	14, 400	0	2–7, 200.
29. Wyoming	do	Sheridan	1964	0	25, 000	0	2–12, 500.
30. Wyoming	do	Sunlight	1964	0	14, 900	0	2–7, 450.
31. Wyoming	do	Thief Creek	1965	0	125, 200		3–41, 734.
Subtotal E				0	1, 037, 350		

F. AUTHORIZED TO BE CONSTRUCTED BY OTHERS—POWER TO BE MARKETED BY BUREAU OF RECLAMATION

1. California	Central Valley (USCE)	Iron Canyon		0	54, 000	0	3–18, 000.
2. South Dakota	Missouri River Basin (USCE)	Big Bend		0	120, 000	0	6–20, 000.
Subtotal F				0	174, 000	0	
Total				5, 211, 050	7, 931, 400		

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[1] Acquired from city of Anchorage for operation with Eklutna project, fiscal year 1955

[2] Powerplant units operated by power allottees under agency contract.

[3] Leased to Public Service Co. of Colorado for operation.

USCE—United States Corps of Engineers.

IBWC—International Boundary and Water Commission.

Transmission Lines

On June 30, 1955, the Bureau of Reclamation's transmission system consisted of 9,069 circuit miles of line. During fiscal year 1955, 321 circuit miles of transmission lines were completed to serve load centers where other trunk transmission facilities were not available. These are shown in table 9.

TABLE 9.—*Transmission lines completed during fiscal year 1955*

Project and line	Voltage (kilovolts)	In-service date	Circuit miles
Missouri River Basin project:			
Fort Randall powerplant to Sioux City	230	April 1955	122.0
Oahe Temporary substation to Bismarck	230	May 1955	171.9
Central Valley project:			
Folsom powerplant to Elverta terminal	230	April 1955	20.2
Nimbus powerplant to Folsom switchyard	115	April 1955	7.0
Total			321.1

Power Contracts

During fiscal year 1955, there were 137 contracts executed for the delivery of electric power supply. A number of these were renewals of operating contracts or revisions of existing contracts resulting from changed operating conditions. Included are:

Number of contracts:
  20 with private utilities.
  39 with REA cooperatives.
  47 with municipalities.
  6 with other Federal agencies.
  13 with public power districts.
  9 with State authorities.
  1 with irrigation district.
  2 miscellaneous type contracts.

The Bureau continued its policy of contracting whenever possible with private utilities, public bodies and cooperatives for wheeling power and energy over existing facilities. The Bureau also entered into several interchange agreements with its customers.

A summary by classification of customers served by Reclamation during fiscal year 1955 is shown in table 10.

The Bureau at the end of fiscal year 1955 had 136 contracts under active negotiation. This included 26 contracts with municipalities, 70 with REA cooperatives, 21 with private utilities, 2 with public power districts, 10 with other Federal agencies, 3 with State authorities, 2 with irrigation districts and 2 miscellaneous type contracts. A number of these are to renew the existing contracts, or to revise contracts in existence due to changes in operating conditions.

TABLE 10.—*Summary by classification of customers for 12 months ending June 30, 1955* [1]

Type of customers	Number of customers	Sales of electric energy kilowatt-hours	Revenue from sales of electric energy
Privately owned utilities	32	2, 648, 229, 566	$9, 147, 237. 97
Municipal utilities	51	1, 355, 926, 872	4, 130, 373. 72
State government utilities	12	3, 347, 446, 302	11, 632, 360. 84
Cooperative utilities (Rural Electrification Administration projects)	112	885, 960, 407	5, 251, 501. 80
Other Federal utilities [2]	5	14, 654, 182, 622	16, 306, 978. 86
Residential and domestic	301	4, 876, 804	27, 215. 79
Rural (other than Rural Electrification Administration projects)	7	175, 400	1, 174. 73
Commercial and industrial	24	86, 281, 369	445, 713. 54
Public authorities	62	1, 059, 613, 131	3, 602, 787. 34
Interdepartmental	42	988, 633, 735	1. 218, 911. 89
Total, all customers	648	25, 031, 325, 608	51, 764, 256. 48

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[1] Does not include energy sales and revenues in transactions between Bureau projects.

[2] Totals include 14,573,567,701 kilowatt-hours delivered to Bonneville Power Administration for marketing and $15,956,430 in payments by that agency.

PROJECT DEVELOPMENT DIVISION

The project development program provides for the investigation of plans for potential projects for the utilization of the water resources of the West for irrigation and for other purposes and for advance planning on newly authorized projects awaiting the initial construction funds.

Comprehensive Basin Surveys

During fiscal year 1955, the Bureau of Reclamation continued the Arkansas-White-Red River Basin survey in cooperation with other interested Federal agencies under the field committee established by the Federal Inter-Agency River Basin Committee on June 12, 1950. By the end of the fiscal year the field work had been practically completed and work was under way on the preparation and review of the comprehensive report with the objective of completing all work early in fiscal year 1956.

Several other basin surveys also were under way but by the end of the fiscal year none had been completed.

New Projects Authorized

During fiscal year 1955, the following projects were authorized by acts of Congress:

Chief Joseph Dam project, Foster Creek Division, Washington.
Deschutes project, North Unit, Haystack equalizing reservoir, Oregon.
Michaud Flats project, Idaho.
Palo Verde diversion project, Arizon–California.

Rogue River Basin project. Talent division and rehabilitation of Medford and Rogue River Valley irrigation district, Oregon.
Santa Margarita project, California.
Santa Maria project, California.

The 1955 Interior Department Appropriation Act provided funds for the start of construction on the Alamogordo Dam spillway enlargement of the Carlsbad project in New Mexico and the Crescent Lake Dam project, Oregon.

The Glendo unit of the Missouri River Basin project was reauthorized by a joint resolution of Congress based on a report submitted in accordance with special provisions of recent Interior Department appropriation acts. Legislation was also passed by Congress to authorize the Ainsworth, Lavaca Flats, Mirage Flats Extension and O'Neill units in the Niobrara River Basin in Nebraska as integral units of the Missouri River Basin project.

Project Planning Reports and Authorizing Legislation

By the end of the fiscal year reports had been submitted to Congress and ordered to be printed as congressional documents for the Juniper division of the Wapinitia project in Oregon and for the Washoe project in California and Nevada. In addition, planning reports for the Crooked River project in Oregon and the McMillan Delta Water Salvage Channel in the Pecos River Basin in New Mexico and a supplemental report on the Trinity River division of the Central Valley project in California were completed and submitted to the interested States and Federal agencies for review. A report was also completed and under review by the end of the fiscal year by affected States and Federal agencies for the Ainsworth unit of the Missouri River Basin project in anticipation of its being submitted to Congress as a basis for approval of construction as required by the authorizing legislation for this unit. A feasibility report on the Ventura River project in California had been submitted to the President and was under review by the Bureau of the Budget by the end of the fiscal year.

During the year bills were considered in Congress to provide permanent authorization for the Bureau's investigation program in Alaska, which in the past had been undertaken on a year-to-year basis based on special language in the annual Department of the Interior appropriation acts, and to authorize construction of the Trinity River division of the Central Valley project in California. Both bills became law by congressional passage and Presidential signature shortly after the end of the 1955 fiscal year.

Bills were introduced to authorize the following projects and hearings were held in both Houses of Congress: The Colorado River storage project and participating projects in Arizona, Colorado, New Mexico, Wyoming, and Utah; the Fryingpan-Arkansas project in Colorado; the Ventura River project in California; and the Washita Basin project in Oklahoma. Of these, the bills for the Colorado River storage project and participating projects and the Washita Basin project were passed by the Senate. A bill was also introduced in both Houses for authorization of the Hells Canyon project in Idaho and Oregon.

Definite Plan Reports

During the fiscal year, definite plan reports were prepared, reviewed and approved for the following projects:

Avondale project, Idaho.
Carlsbad project, Alamogordo Dam spillway enlargement, New Mexico.
Crescent Lake Dam project, Oregon.
Deschutes project, north unit, Haystack equalizing reservoir, Oregon.

River Compacts

The consent of the Congress was given to the Sabine River compact between Texas and Louisiana.

The Bear River compact was signed by the compact commissioners and submitted to the State legislatures of Utah, Wyoming, and Idaho for ratification.

The Columbia River compact was reviewed and comments on the proposed compact and draft of the Federal representative's report were furnished through the Secretary of the Interior to the Federal representative. The compact was approved by the Columbia Interstate Compact Commission and submitted to the State legislatures of Washington, Oregon, Idaho, Montana, Wyoming, Utah, and Nevada for ratification.

Comments were furnished to the Secretary of the Interior on proposed bills granting consent of the Congress to negotiation of compacts between the States of California and Oregon regarding the Klamath River; between Oklahoma and Arkansas and between Oklahoma and Kansas regarding the Arkansas River; between the 10 Missouri River Basin States regarding the Missouri River; between California and Nevada regarding the Carson, Truckee, and Walker Rivers; and Arkansas, Louisiana, Oklahoma, and Texas regarding the Red River.

Hydrologic services in connection with interstate compacts were also rendered during the year. These services included advice to the Upper Colorado River Commission and to the Columbia Interstate Compact Commission.

International Stream Investigations

The Bureau of Reclamation was represented on International Engineering Boards of the United States section of the International Joint Commission. The Boards continued their engineering studies for use of the Commission in its consideration of the Waterton-Belly and Souris-Red Rivers references of January 12, 1948. These references concern the apportionment of the waters of those international streams between the United States and Canada. The Souris-Red Rivers Engineering Board submitted to the Commission its report with respect to the Souris River under items 1, 2, and 3 of that reference.

Hydrology

Development of improved technical procedures applicable to basic hydrologic investigations of proposed reclamation projects was accomplished in the field of sediment, flood control, water resources, and forecasting of stream flow.

A report on a method of estimating the magnitude and occurrence of return flow from irrigated areas was completed. While this method was developed primarily for use in stable channel design, it will be useful also in other types of engineering analysis. Considerable progress was made also in the refinement of methods for determining total sediment transport capacity of natural and artificial channels and for computing the characteristics of stable artificial channels.

Field and office work was continued during the year on major storms that have occurred in the 17 Western States. These storm data provide the basis for determination of design storms for reclamation structures. Work was continued on the development and refinement of methods for the hydrographic analysis of flood flows produced by snowmelt or a combination of rain and snowmelt in pervious mountain areas.

Irrigation water requirement experimental data, collected and published by other agencies, were compiled and studied with the eventual goal of developing more accurate methods of estimating irrigation requirements for planning studies.

A method for determining the monthly gross evaporation loss from Lake Mead was developed and is currently being used in routine reservoir operations. Development of a method for short-term rate-of-inflow forecasts, based on the recession concept, was prepared to assist flood control operation of Shasta Lake. Progress continued on the development of methods for computation of both seasonal water-yield and rate-of-runoff forecasts.

Extensive work was performed in connection with development and review of hydrologic studies for foreign projects in Australia, Ethiopia, Lebanon, Thailand, Formosa, and the Philippine Islands.

DIVISION OF PROGRAM COORDINATION AND FINANCE

Financial Operations

Under the reorganization plan of the Bureau of Reclamation the regional directors were vested with increased responsibility for executing financial procedures and acting on audit and other reports which disclosed deficiencies in the regional functions. A plan was developed to delegate to regional field accounting units the role of performing the work associated with this responsibility.

The reorganization of the Solicitor's office of the Department necessitated a change in procedures for financing the operations of that office. Instructions were formulated whereby reclamation offices will be reimbursed for the miscellaneous services and supplies provided to the Solicitor's field and regional offices.

Necessary accounting procedures were developed to implement the revised policy of the Bureau in transferring property between reclamation projects to other Interior agencies and to water users organizations. The objective of the revised policy is to affect a greater utilization of reclamation property and to establish appropriate accountability in the financial records.

The relation of Bureau of Reclamation accounting to proposed Civil Service Commission standards for the classification of professional accountants was given attention during the fiscal year. Revisions in the proposed standards and justifications were transmitted to the Civil Service Commission in order to assure personnel of a desirable professional level and competency for the performance of reclamation accounting.

Statistics

Statistics activity during the year included developing, maintaining and furnishing central statistical service on items such as project feasibilities and authorizations, Reclamation Fund, appropriations and allotments, investments and expenditures, costs, revenues, cost allocations and repayments, operating programs, status and utilization of funds and employment and personal services.

It also involved preparation of the Bureau's Monthly Activities Report and quarterly Progress Report, publication of a Statistical Appendix to the Annual Report of the Commissioner, and compilation and processing of reports on financial operations, program accomplishments and other data. Continuing review of operations resulted in the elimination of unnecessary reports in the interest of economy and efficiency.

Schedules

Procedures governing the integrated system of estimating, programing, reporting and accounting in use by the Bureau were revised and simplified. Studies by special committees of the construction and operation and maintenance schedules resulted in the elimination of unessential details reducing the size of the program documents and conserving filing and storage space.

The revised scheduling procedures and forms were first used in the preparation of preliminary estimates for fiscal year 1957. While minor revisions may be necessary, it is already apparent that the new procedure will result in a considerable saving of time and labor.

It is gratifying to note that the procedures now in use by the Bureau of Reclamation are, in general, very closely in conformance with the recommendations of the Commission on Organization of the Executive Branch of the Government in its report on "Budget and Accounting" dated June 1955. Experience with this system has indicated that it lends itself most readily to an integrated procedure whereby estimates, schedules, reports, and accounts can be related to each other and at the same time provide meaningful information as to progress of activities.

Budget

Appropriations made available to the Bureau of Reclamation for fiscal year 1955 totaled $163,207,000 including $831,570, later transferred to the Solicitor's office of the Department, leaving a net appropriation of $162,375,430. This did not include $3,865,329 in permanent appropriations. The appropriation represents an increase of $19,537,340 over the appropriation for fiscal year 1954.

With an unobligated balance of 9.1 million plus funds advanced by water users, trust funds, a continuing fund for emergency expenses, Fort Peck project and working funds, the money available for reclamation was $175.7 million. Of this amount, however, $1.7 million was rescinded, $6.5 million was placed in budgetary reserve, and $2 million was scheduled for obligation in future years, leaving a net amount programed of $165.5 million. Of this amount there remained unobligated at the close of 1955 funds in the amount of $11.8 million.

Obligations for fiscal year 1955 totaled 155.6 million or 94 percent of the obligations programed as compared with 96.3 percent of the program accomplished in 1954.

The 1955 Appropriation Act, included certain restrictions upon the Bureau. The Bureau was directed not to initiate construction on transmission facilities in areas covered by power wheeling contracts unless the power companies in such areas were unable or unwilling to construct the facilities.

The limitation on the amount of money which may be expended for work by Government forces (force account work) was included again in the 1955 act. This limitation provided that not to exceed 12 percent of the allotment for any one project or unit of the Missouri River Basin project, with a maximum of $225,000 for any such project or unit, was to be so used. Also again as in recent years a limitation was placed upon the amount of money that could be expended for information services. By administrative determination this limitation was placed at $17,300.

The amounts appropriated by activity for fiscal year 1955, together with the amounts to be derived from the special and general funds, follow:

Table 11.—*Condensed statement of appropriations, fiscal year 1955 exclusive of trust funds and permanent appropriations*

General investigations	$3, 750, 000
Reclamation fund	(3, 150, 000)
Colorado River Dam fund, Colorado River Development fund	(500, 000)
General fund	(100, 000)
Construction and rehabilitation	133, 757, 000
Reclamation fund	(57, 946, 197)
General fund	(75, 810, 803)
Operation and maintenance	21, 500, 000
Reclamation fund	(18, 257, 222)
Colorado River Dam fund	(1, 942, 778)
General fund	(1, 300, 000)
General administrative fund	4, 000, 000
Reclamation fund	(4, 000, 000)
Emergency fund	200, 000
Reclamation fund	(200, 000)
Grand total	163, 207, 000
Reclamation fund	(83, 553, 419)
Colorado River Dam fund	(2, 442, 778)
General fund	(77, 210, 803)

TABLE 12.—*Annual appropriations from Reclamation and other funds, fiscal years 1902–55*

Fiscal year	Reclamation fund [1]	General fund	Colorado River Dam fund	Emergency relief funds [2]	Fort Peck continuing fund	Permanent appropriations	Total
1902	[3] $165,000						(3)
1903	[3] 5,950,000						(3)
1904	[3] 18,440,000						[3] $2,000,000
1905	[3] 8,758,000						(3)
1906	[3] 24,894,961						[3] 15,363,800
1907	[3] [4] 41,979,161						(3)
1907	19,186,161						[3] 18,051,161
1908	9,526,038						9,562,038
1909	9,180,700						9,180,700
1910	8,183,300						8,183,300
1911	26,896,790						26,896,790
1912	8,262,367						8,262,367
1913	8,300,508						8,300,508
1914	15,931,922						15,931,922
1915	1,261,411						1,261,411
1916	13,530,000						13,530,000
1917	8,887,557	$15,000					8,902,557
1918	8,227,000	310,213					8,537,213
1919	9,397,081	443,196					9,840,277
1920	7,300,000	548,927					7,848,927
1921	8,463,000	661,177					9,124,177
1922	20,266,000	335,871					20,601,871
1923	14,800,000	559,530					15,359,530
1924	13,800,000	314,067					14,114,067
1925	11,890,809						11,890,809
1926	12,563,240	687,336					13,250,576
1927	7,436,320	75,000					7,511,320
1928	12,148,800	122,640					12,271,440
1929	14,328,400	115,000					14,443,400
1930	8,643,000	10,760,000					19,403,000
1931	9,482,000	100,000					9,582,000
1932	7,271,000	25,100,000					32,371,000
1933	2,817,288	13,050,000					15,867,288
1934	3,408,000	8,048,000		$103,535,000			114,991,000
1935	1,176,750			34,076,000			35,252,750
1936	1,388,100	15,950,000		25,438,000			42,776,100
1937	12,344,600	34,850,000	$350,000	[4] 4,873,000			42,671,600
1938	12,322,600	30,570,000	500,000	37,047,500		$1,100,000	81,540,100
1939	10,940,600	32,995,000	500,000	[4] 2,502,488		4,600,000	46,533,112
1940	13,875,600	64,215,000	575,000	28,347		5,700,000	84,393,947
1941	10,000,600	63,260,000	768,000	[4] 124,300		6,600,000	80,504,300
1942	8,111,000	92,862,031	1,000,000	[4] 19,961		2,600,000	104,553,070
1943	3,607,960	86,745,460	1,379,250	[4] 1,131		2,600,000	94,331,539
1944	4,514,475	35,712,000	1,443,100	[4] 72,709	$300,000	5,600,000	47,496,866
1945	7,649,800	18,637,200	2,200,000	[4] 22,332	100,000	13,100,000	41,664,668
1946	36,617,890	83,527,750	2,550,000		200,000	4,856,302	127,751,942
1947	39,600,213	75,901,805	1,814,330	[4] 30,396		4,600,000	121,885,952
1948	25,676,750	115,505,288	2,088,000		308,000	5,280,000	148,858,038
1949	36,952,264	227,636,453	2,450,000		355,000	4,440,000	271,833,717
1950	44,759,817	312,269,875	2,123,100		403,229	7.641,440	367,197,461
1951	46,917,165	222,453,635	2,308,000		358,605	5,738,210	277,775,615
1952	51,422,347	180,665,175	2,171,000		1,044,995	6,621,607	241,925,124
1953	72,945,450	130,859,541	2,643,000		639,950	7,743,965	214,831,906
1954	74,884,496	65,505,454	2,679,710		648,783	4,610,748	148,329,191
1955	83,553,419	75,444,114	2,442,778		803,218	5,953,500	168,197,029
Total	916,915,388	2,026,811,738	31,985,268	192,478,530	5,161,780	[5] 99,385,772	3,272,738,476

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[1] Prior to fiscal year 1916 funds were made available to Reclamation Service by allotments from the reclamation fund, authorized by the Secretary of the Interior.

[2] Emergency relief funds include allocations to reclamation from NIRA, PWA, and ERA funds.

[3] Allotments made prior to Fallon, Nevada Conference on July 27, 1907, were canceled and summary allotments issued. Original amounts excluded from total column.

[4] Credit.

[5] Repayment of advances included: Boulder Canyon, $21,634,120; and All-American Canal system, $2,752,000

TABLE 13.—*The Reclamation fund, fiscal years 1954–56, funds available for appropriation*

Receipts and appropriations	Actual, 1954	Actual, 1955	Estimated, 1956
Unappropriated balance brought forward (as of June 30)	$78, 234, 264	$88, 033, 071	$92, 751, 703
Add items in transit	----------	----------	37, 705
Accretions and collections:			
Bureau of Reclamation and other agencies, (.100)	14, 276, 770	[1] 16, 014, 551	14, 600, 000
Other agencies, (.200)	27, 943, 980	32, 282, 541	37, 778, 200
Power revenues, (.300)	41, 578, 238	38, 462, 092	47, 800, 000
Subtotal, accretions and collections	83, 798, 988	86, 759, 184	100, 178, 200
Lapsed appropriations	995, 063	1, 666, 367	1, 080, 000
Total available for appropriation	163, 028, 315	176, 458, 622	194, 047, 608
Less permanently authorized appropriations for:			
Refund of revenue collections	100, 000	150, 000	----------
Farmers irrigation district, North Platte project, Nebraska	10, 748	3, 500	8, 000
Deduct annual appropriation or estimate for:			
General investigations	2, 400, 000	3, 150, 000	4, 421, 812
Construction and rehabilitation	52, 509, 206	57, 946, 197	69, 287, 000
Operation and maintenance	15, 075, 290	18, 257, 222	20, 223, 638
General administrative expenses	4, 500, 000	4, 000, 000	3, 600, 000
Emergency fund	400, 000	200, 000	500, 000
Subtotal, annual appropriation or estimate	74, 884, 496	83, 553, 419	98, 032, 450
Balance carried forward	88, 033, 071	92, 751, 703	96, 007, 158

[1] Includes the amount of $1,282,095.90 transferred from (.200); and additional collections made by other agencies during fiscal year 1955.

TABLE 14.—*Accretions to Reclamation Fund by States, fiscal year 1955*

State or other accretions	Sale of public land		Proceeds from Oil Leasing Act		Total to June 30 1955
	Fiscal year 1955	To June 30, 1955	Fiscal year 1955	To June 30, 1955	
Alabama	----------	----------	$5, 043. 94	$208, 910. 66	$208, 910. 66
Arizona	$78, 929. 78	$3, 063, 339. 94	74, 783. 98	346, 203. 02	3, 409, 542. 96
Arkansas	----------	----------	7, 977. 76	19, 354. 29	19, 354. 29
California	533, 672. 47	10, 351, 841. 85	5, 172, 964. 60	61, 011, 140. 81	71, 362, 982. 66
Colorado	167, 710. 23	11, 067, 155. 43	4, 394, 497. 10	25, 071, 385. 62	36, 138, 541. 05
Florida	----------	----------	79. 67	1, 937. 64	1, 937. 64
Idaho	170, 381. 35	7, 960, 849. 82	63, 980. 98	560, 477. 12	8, 521, 326. 94
Illinois	----------	----------	----------	42. 00	42. 00
Kansas	4, 013. 99	1, 045, 543. 42	46, 713. 05	342, 135. 93	1, 387, 679. 35
Louisiana	----------	----------	53, 423. 40	588, 411. 17	588, 411. 17
Michigan	----------	----------	2, 768. 65	25, 646. 87	25, 646. 87
Mississippi	----------	----------	2, 946. 50	13, 880. 41	13, 880. 41
Montana	207, 072. 99	16, 089, 165. 98	1, 146, 941. 62	9, 791, 884. 12	25, 881, 050. 10
Nebraska	11, 242. 34	2, 209, 980. 44	4, 037. 38	52, 480. 51	2, 262, 460. 95
Nevada	58, 026. 92	1, 207, 979. 39	775, 837. 61	2, 232, 551. 79	3, 440, 531. 18
New Mexico	63, 944. 20	7, 192, 567. 99	4, 375, 588. 96	30, 687, 018. 54	37, 879, 586. 53
North Dakota	5, 742. 27	12, 274, 371. 05	59, 155. 73	680, 786. 56	12, 955, 157. 61
Oklahoma	284. 46	5, 968, 809. 70	25, 893. 83	196, 276. 93	6, 165, 086. 63
Oregon	694, 011. 33	14, 571, 542. 67	60, 112. 28	107, 295. 99	14, 678, 838. 66
South Dakota	22, 877. 49	7, 795, 935. 54	134, 561. 27	485, 115. 50	8, 281, 051. 04
Utah	86, 937. 53	4, 802, 097. 93	2, 036, 389. 45	9, 600, 068. 90	14, 402, 166. 83
Washington	209, 971. 49	8, 545, 684. 30	2, 940. 53	62, 340. 32	8, 608, 024. 62
Wyoming	63, 695. 27	9, 342, 692. 63	11, 201, 713. 82	103, 083, 558. 48	112, 426, 251. 11
Total	2, 378, 514. 11	123, 489, 558. 08	29, 648, 352. 11	245, 168, 903. 18	368, 658, 461. 26

OTHER ACCRETIONS

	Fiscal year 1955	Total to June 30, 1955
Proceeds, Federal water power licenses	$71, 009. 66	$1, 414, 619. 72
Proceeds, Potassium royalties and rentals	1, 380, 515. 49	9, 269, 633. 17
Receipts from naval petroleum reserves, 1920–38, act of May 9, 1938	----------	29, 778, 300. 23
Proceeds from rights-of-way over withdrawn lands, act of July 19, 1919	264. 67	11, 637. 19
Lease of lands	(1)	----------
Townlot sales		
Timber sales, and other miscellaneous items		
Miscellaneous items, other	----------	5. 78
Total	1, 451, 789. 82	40, 474, 196. 09
Grand total	33, 478, 656. 044	409, 132, 657. 35

[1] The amount of $1,196,115.20 plus collections made by other agencies during fiscal year 1955, $85,980.70, totaling $1,282,095.90, were transferred to (.100), for project recording purposes.

TABLE 15.—*Cost of plant, property and equipment, by States, June 30, 1955*

State and project	Completed works					Construction in progress	Other physical property	Total
	Multi-purpose (1)	Irrigation (2)	Electric (3)	Municipal water (4)	Flood control (5)	(6)	(7)	(8)
Total	$987, 186, 637	$779, 557, 805	$574, 671, 487	$14, 041, 384	$13, 319, 716	$285, 583, 593	$20, 746, 915	$2, 675, 107, 537
Alaska: Eklutna			32, 374, 304					32, 374, 304
Arizona, subtotal	90, 417, 583	50, 482, 203	104, 095, 356		3, 454, 724	14, 861, 062	109, 394	263, 420, 322
Boulder Canyon:								
All-American Canal system (California)	2, 179, 950							2, 179, 950
Hoover Dam and powerplant (Nevada)	44, 545, 300		33, 554, 931			242, 327		78, 342, 558
Colorado River front work and levee system (California-Nevada)					3, 454, 724	22, 317		3, 477, 041
Gila		35, 269, 534	95, 100			4, 894, 123	109, 394	40, 368, 151
Parker-Davis (California-Nevada)	38, 467, 443		66, 086, 373			4, 601, 823		109, 155, 639
Salt River	5, 224, 890	10, 753, 356	4, 266, 443			5, 046, 969		25, 291, 658
Yuma (California)		3, 844, 931	92, 509			166		3, 937, 606
Yuma auxiliary		614, 382				53, 337		667, 719
California, subtotal	291, 518, 660	126, 446, 570	86, 182, 274		9, 477, 000	74, 491, 249	4, 055, 177	592, 170, 930
Boulder Canyon: All-American Canal system (California)	38, 459, 336	16, 526, 315	45, 091		3, 329, 786	79, 435		58, 439, 963
Cachuma	22, 199, 273					19, 489, 739		41, 689, 012
Central Valley	225, 437, 946	98, 141, 131	67, 437, 513			47, 307, 173	4, 055, 177	442, 378, 940
Colorado River front work and levee system (Arizona-Nevada)					6, 147, 214	121, 564		6, 268, 778
Klamath (Oregon)		6, 303, 654				54, 456		6, 358, 110
Orland		2, 623, 901						2, 623, 901
Parker-Davis (Arizona-Nevada)	5, 422, 105		18, 197, 820			371, 235		23, 991, 160
Solano						7, 066, 966		7, 066, 966
Truckee storage (Nevada)								
Yuma (Arizona)		2, 851, 569	501, 850			681		3, 354, 100
Colorado, subtotal	53, 403, 787	103, 814, 347	42, 221, 452			2, 071, 845		201, 511, 431
Colorado-Big Thompson	36, 260, 659	78, 856, 350	41, 559, 484			43, 698		156, 720, 191
Fruitgrowers Dam		200, 309						200, 309
Grand Valley		6, 867, 055	213, 669					7, 080, 724
Mancos		3, 895, 150						3, 895, 150
Missouri River Basin	13, 273, 508		448, 299			1, 029, 281		14, 751, 088

Paonia		1, 576, 054				19, 851		1, 595, 905
Pine River		3, 453, 470				2, 403		3, 455, 873
San Luis Valley	3, 869, 620					976, 612		4, 846, 232
Uncompahgre		8, 965, 959						8, 965, 959
Idaho, subtotal	50, 847, 560	33, 479, 611	9, 132, 087	1, 020, 096		43, 187, 401		137, 666, 755
Avondale						238, 277		238, 277
Boise (Oregon)	41, 720, 156	16, 222, 566	6, 425, 600			33, 511		64, 401, 833
Dalton Gardens						258, 438		258, 438
King Hill		1, 877, 732						1, 877, 732
Lewiston Orchards	426, 999	1, 037, 302		1, 020, 096				2, 484, 397
Minidoka (Wyoming)	8, 700, 405	12, 507, 351	2, 706, 487			1, 707, 361		25, 621, 604
Owyhee (Oregon)		902, 000				176		902, 176
Palisades (Wyoming)						40, 949, 638		40, 949, 638
Preston Bench		450, 300						450, 300
Rathdrum Prairie		482, 360						482, 360
Iowa: Missouri River Basin Transmission Lines			4, 092, 213			970, 606		5, 062, 819
Kansas, subtotal	13, 688, 607	334, 475				28, 205, 937		42, 229, 019
Garden City		334, 475						334, 475
Missouri River Basin	13, 688, 607					28, 205, 937		41, 894, 544
Minnesota: Missouri River Basin Transmission Lines						102, 288		102, 288
Montana, subtotal	99, 389, 714	32, 006, 770	39, 787, 674			25, 318, 904		196, 503, 062
Bitter Root		955, 051				68, 090		1, 023, 141
Buffalo Rapids		4, 296, 876				271, 844		4, 568, 720
Fort Peck (North Dakota)			9, 575, 127			272, 866		9, 847, 993
Frenchtown		290, 797						290, 797
Hungry Horse	79, 566, 923		21, 728, 818			160, 748		101, 456, 489
Huntley		1, 552, 159						1, 552, 159
Intake		92, 371						92, 371
Lower Yellowstone (North Dakota)		3, 077, 537						3, 077, 537
Milk River		9, 439, 804				349, 375		9, 789, 179
Missoula Valley		278, 322						278, 322
Missouri River Basin	19, 822, 791	2, 017, 428	8, 483, 729			24, 130, 720		54, 454, 668
Shoshone (Wyoming)		16, 400						16, 400
Sun River		9, 990, 025				65, 261		10, 055, 286
Nebraska, subtotal	36, 892, 834	31, 580, 222	6, 251, 590			11, 217, 185		85, 941, 831
Mirage Flats		3, 102, 575						3, 102, 575
Missouri River Basin	36, 892, 834	19, 523, 717	6, 036, 779			11, 082, 808		73, 536, 138
North Platte (Wyoming)		8, 953, 930	214, 811			134, 377		9, 303, 118

See footnotes at end of table.

TABLE 15.—*Cost of plant, property and equipment, by States, June 30, 1955*—Continued

State and project	Completed works: Multi-purpose (1)	Completed works: Irrigation (2)	Completed works: Electric (3)	Completed works: Municipal water (4)	Completed works: Flood control (5)	Construction in progress (6)	Other physical property (7)	Total (8)
Nevada, subtotal	$53, 376, 610	$9, 861, 880	$35, 251, 983		$115, 123	$339, 435	$7, 193, 378	$106, 138, 409
Boulder Canyon:								
Hoover Dam and powerplant (Arizona)	49, 946, 649		31, 264, 568			197, 494	1, 812, 230	83, 220, 941
Boulder City municipal office							5, 381, 148	5, 381, 148
Colo. River front work and levee system (Arizona-California)					115, 123			115, 123
Humboldt		1, 214, 321				1, 736		1, 216, 057
Newlands		7, 555, 136	344, 343					7, 899, 479
Parker-Davis (Arizona-California)	3, 429, 961		3, 643, 072			140, 205		7, 213, 238
Truckee storage (California)		1, 092, 423						1, 092, 423
New Mexico, subtotal	13, 150, 594	28, 246, 621	7, 787, 021		272, 869	5, 209, 075		54, 666, 180
Carlsbad		4, 242, 338				207, 649		4, 449, 987
Fort Sumner		2, 427, 792						2, 427, 792
Hondo		371, 788						371, 788
Middle Rio Grande	3, 741, 926	150, 752				3, 640, 367		7, 533, 045
Rio Grande (Texas)	8, 132, 800	5, 540, 689	7, 787, 021		272, 869	194, 049		21, 927, 428
Tucumcari		15, 513, 262						15, 513, 262
Vermejo	1, 275, 868					1, 167, 010		2, 442, 878
North Dakota, subtotal	9, 124, 095	2, 855, 042	20, 468, 869			4, 822, 887		37, 270, 893
Buford-Trenton (W. C. U.)		858, 614						858, 614
Buford-Trenton (old)		223, 423						223, 423
Buford-Trenton protection and improvement work		68, 714				6, 033		74, 747
Fort Peck (Montana)			1, 423, 614			307, 795		1, 731, 409
Lower Yellowstone (Montana)		555, 682						555, 682
Missouri River Basin	9, 124, 095	739, 514	19, 045, 255			4, 509, 059		33, 417, 923
Williston		409, 095						409, 095
Oklahoma: W. C. Austin	6, 955, 676	5, 565, 191		$152, 026				12, 672, 893
Oregon, subtotal		48, 940, 410	583, 940			969, 053	22, 010	50, 515, 413
Arnold								
Baker		281, 589						281, 589
Boise (Idaho)		4, 275						4, 275
Burnt River		601, 026						601, 026
Crescent Lake Dam						121, 667		121, 667
Deschutes		11, 735, 943	515, 304			52, 790		12, 304, 037
Grants Pass						668, 454		668, 454
Klamath (California)		7, 922, 887	68, 636			104, 413	22, 010	8, 117, 946

Ochoco								
Owyhee (Idaho)		18, 217, 520				21, 729		18, 239, 249
Umatilla		5, 310, 346						5, 310, 346
Vale		4, 866, 824						4, 866, 824
South Dakota, subtotal	17, 820, 254	8, 321, 056	29, 857, 221			11, 923, 819	53, 443	67, 975, 793
Belle Fourche		5, 032, 546				264		5, 032, 810
Missouri River Basin	16, 894, 351	3, 288, 510	29, 857, 221			11, 923, 555	53, 443	62, 017, 080
Rapid Valley	925, 903							925, 903
Texas, subtotal	23, 499, 080	5, 275, 146	464, 801			46, 692		29, 285, 719
Balmorhea		407, 741						407, 741
Colorado River	23, 499, 080		464, 801					23, 963, 881
Falcon Dam								
Rio Grande (New Mexico)		4, 867, 405				46, 692		4, 914, 097
Rio Grande River rectification								(1)
Utah, subtotal	15, 153, 509	19, 697, 818	91, 969	12, 869, 262		10, 682, 729	61, 085	58, 556, 372
Hyrum		953, 854						953, 854
Moon Lake		1, 799, 859						1, 799, 859
Newton		712, 592						712, 592
Ogden River		5, 013, 284						5, 013, 284
Provo River	15, 153, 509	3, 768, 627		12, 869, 262		243, 333		32, 034, 731
Sanpete		433, 940						433, 940
Scofield		943, 837						943, 837
Strawberry Valley		3, 345, 940	91, 969				61, 085	3, 498, 994
Weber Basin						10, 439, 396		10, 439, 396
Weber River		2, 725, 885						2, 725, 885
Washington, subtotal	165, 954, 968	216, 173, 371	108, 404, 200			41, 969, 788	3, 598, 154	536, 100, 481
Columbia Basin	161, 510, 003	175, 450, 481	107, 081, 493			32, 724, 663	3, 598, 154	480, 364, 794
Okanogan		1, 484, 324				22, 153		1, 506, 477
Yakima	4, 444, 965	39, 238, 566	1, 322, 707			9, 222, 972		54, 229, 210
Wyoming, subtotal	45, 993, 106	56, 477, 012	47, 624, 533			9, 193, 638	1, 013, 899	160, 302, 188
Eden		3, 785, 846				835, 424		4, 621, 270
Kendrick	5, 162, 343	9, 637, 574	14, 766, 194			469, 161		30, 035, 272
Minidoka (Idaho)		2, 209, 904						2, 209, 904
Missouri River Basin	32, 728, 914		27, 723, 596			6, 509, 455	800	66, 962, 765
North Platte (Nebraska)	3, 240, 716	8, 565, 468	1, 253, 400			119, 143		13, 178, 727
Palisades (Idaho)						505, 708		505, 708
Riverton	2, 970, 469	16, 390, 005	463, 953			635, 928	1, 011, 725	21, 472, 080
Shoshone (Montana)	1, 890, 664	15, 888, 215	3, 417, 390			118, 819	1, 374	21, 316, 462
Nonproject property		60					4, 640, 375	4, 640, 435

NOTE.—Name of State in which balance of project is located is indicated by parentheses. Irrigation plant listed at gross construction cost prior to deduction of chargeoffs authorized by Congress.

[1] Transferred to State Department.

TABLE 16.—*Repayment contracts—matured and unmatured—June 30, 1955*

Project and State	Value of repayment contracts			Unmatured charges				Repayment contracts matured	Due and unpaid
	Construction	Rehabilitation and betterment	Total	Construction water-right charges unmatured	Water-right charges deferred and unmatured	Rehabilitation and betterment charges unmatured	Total unmatured		
Arnold, Oreg		$197, 925. 82	$197, 925. 82			$171, 314. 40	$171, 314. 40	$26, 611. 42	$3, 333. 37
Avondale, Idaho	$277, 000. 00		277, 000. 00	$277, 000. 00			277, 000. 00		
W. C. Austin, Okla	3, 262, 188. 49		3, 262, 188. 49	2, 852, 675. 00			2, 852, 675. 00	409, 513. 49	
Baker, Oreg	225, 014. 54		225, 014. 54	98, 084. 54	$20, 193. 25		118, 277. 79	106, 736. 75	
Balmorhea, Tex	255, 600. 00		255, 600. 00	236, 347. 50			236, 347. 50	19, 252. 50	
Belle Fourche, S. Dak	4, 230, 188. 73		4, 230, 188. 73	2, 768, 313. 19			2, 768, 313. 19	1, 461, 875. 54	
Bitter Root, Mont	952, 741. 05	100, 000. 00	1, 052, 741. 05	592, 010. 07		100, 000. 00	692, 010. 07	360, 730. 98	
Boise, Idaho-Oreg.:									
Arrowrock division	13, 682, 811. 30		13, 682, 811. 30	2, 583, 167. 02	1, 028, 512. 58		3, 611, 679. 60	10, 071, 131. 70	33, 767. 90
Payette division	8, 741, 768. 81		8, 741, 768. 81	7, 431, 741. 15	80, 230. 98		7, 511, 972. 13	1, 229, 796. 68	
Anderson Ranch Dam	5, 146, 511. 01		5, 146, 511. 01	4, 652, 599. 13			4, 652, 599. 13	493, 911. 88	80. 00
Boulder Canyon, Ariz.-Calif									
All-American Canal system	52, 395, 658. 05		52, 395, 658. 05	52, 201, 179. 75			52, 201, 179. 75	194, 478. 30	
Buffalo Rapids, 1st division, Montana	930, 000. 00		930, 000. 00	916, 700. 00			916, 700. 00	13, 300. 00	6, 650. 00
Buffalo Rapids, 2d division, Montana	696, 000. 00		696, 000. 00	687, 400. 00			687, 400. 00	8, 600. 00	4, 300. 00
Burnt River, Oreg	599, 735. 00		599, 735. 00	359, 828. 08			359, 828. 08	239, 906. 92	
Cachuma, Calif	5, 800, 000. 00		5, 800, 000. 00	5, 800, 000. 00			5, 800, 000. 00		
Carlsbad, N. Mex	3, 741, 760. 67	25, 000. 00	3, 766, 760. 67	1, 922, 098. 66	64, 070. 00	25, 000. 00	2, 011, 168. 66	1, 755, 592. 01	
Central Valley, Calif	62, 574, 984. 00		62, 574, 984. 00	62, 546, 846. 50			62, 546, 846. 50	28, 137. 50	
Colorado-Big Thompson, Colo	26, 031, 000. 00		26, 031, 000. 00	26, 030, 000. 00			26, 030, 000. 00	1, 000. 00	
Colorado River, Tex	5, 510, 500. 00		5, 510, 500. 00	5, 510, 500. 00			5, 510, 500. 00		
Columbia Basin, Wash	87, 547, 376. 96		87, 547, 376. 96	87, 499, 270. 79			87, 499, 270. 79	48, 106. 17	
Crescent Lake Dam, Oreg		320, 000. 00	320, 000. 00			320, 000. 00	320, 000. 00		
Dalton Gardens, Idaho	270, 200. 00		270, 200. 00	270, 200. 00			270, 200. 00		
Deschutes, Oreg	12, 757, 159. 80		12, 757, 159. 80	12, 551, 721. 30			12, 551, 721. 30	205, 438. 50	
Eden, Wyo	1, 500, 000. 00		1, 500, 000. 00	1, 500, 000. 00			1, 500, 000. 00		
Fort Sumner, N. Mex	2, 432, 166. 55		2, 432, 166. 55	2, 371, 362. 39			2, 371, 362. 39	60, 804. 16	
Frenchtown, Mont	297, 282. 04		297, 282. 04	242, 526. 63			242, 526. 63	54, 755. 41	
Fruitgrowers Dam, Colo	198, 240. 71		198, 240. 71	149, 345. 43			149, 345. 43	48, 895. 28	
Gila, Ariz	42, 475, 000. 00		42, 475, 000. 00	42, 467, 083. 34			42, 467, 083. 34	7, 916. 66	
Grand Valley, Ariz	3, 629, 546. 86	1, 658, 327. 73	5, 287, 874. 59	2, 184, 729. 48	91, 571. 84	1, 644, 827. 73	3, 921, 129. 05	1, 366, 745. 54	
Grants Pass, Oreg		950, 000. 00	950, 000. 00			942, 500. 00	942, 500. 00	7, 500. 00	
Humboldt, Nev	1, 211, 244. 68		1, 211, 244. 68	779, 761. 62			779, 761. 62	431, 483. 06	
Huntley, Mont	1, 837, 433. 68		1, 837, 433. 68	755, 290. 14	91, 478. 25		846, 768. 39	990, 665. 29	
Hyrum, Utah	944, 046. 36		944, 046. 36	687, 282. 00			687, 282. 00	256, 764. 36	
Intake, Mont	46, 900. 00		46, 900. 00	44, 660. 00			44, 660. 00	2, 240. 00	
Kendrick, Wyo	2, 800, 000. 00		2, 800, 000. 00	2, 800, 000. 00			2, 800, 000. 00		

Klamath, Oreg.-Calif.	4, 313, 501. 07	40, 200. 26	4, 353, 701. 33	1, 279, 188. 54	198, 335. 54	38, 190. 13	1, 515, 714. 21	2, 837, 987. 12	1, 103. 59
Lewiston Orchards, Idaho	2, 500, 000. 00		2, 500, 000. 00	2, 457, 535. 72			2, 457, 535. 72	42, 464. 28	
Lower Yellowstone, Mont.-N. Dak	4, 084, 366. 39		4, 084, 366. 39	1, 463, 976. 68	381, 275. 58		1, 845, 252. 26	2, 239, 114. 13	
Mancos, Colo	900, 000. 00		900, 000. 00	885, 000. 00			885, 000. 00	15, 000. 00	
Middle Rio Grande, N. Mex	16, 533, 000. 00		16, 533, 000. 00	16, 533, 000. 00			16, 533, 000. 00		
Milk River, Mont	7, 863, 524. 89	134, 851. 00	7, 998, 375. 89	6, 609, 625. 11	48, 508. 78	134, 851. 00	6, 792, 984. 89	1, 205, 391. 00	12, 780. 41
Minidoka, Idaho-Wyo	20, 804, 525. 02		20, 804, 525. 02	5, 210. 073. 99	120. 37		5, 210, 194. 36	15, 594, 330. 66	936. 08
Mirage Flats, Nebr	846, 300. 00		846, 300. 00	842, 300. 00			842, 300. 00	4, 000. 00	
Missoula Valley, Mont	45, 000. 00		45, 000. 00	45, 000. 00			45, 000. 00		
Missouri River Basin:									
Bostwick division, Nebraska-Kansas	6, 605, 000. 00		6, 605. 000. 00	6, 605, 000. 00			6, 605, 000. 00		
Angostura unit, South Dakota	718, 000. 00		718, 000. 00	718, 000. 00			718, 000. 00		
Frenchman-Cambridge division Nebraska	2, 328, 800. 00		2, 328, 800. 00	2, 328, 800. 00			2, 328, 800. 00		
Fort Clark unit, North Dakota	66, 000. 00		66, 000. 00	66, 000. 00			66, 000. 00		
Kirwin unit, Kansas	1, 500. 000. 00		1, 500, 000. 00	1, 500, 000. 00			1, 500, 000. 00		
Savage unit, Montana	143, 750. 00		143, 750. 00	143, 665. 02			143, 665. 02	84. 98	
Sargent unit, Nebraska	1, 785, 400. 00		1, 785, 400. 00	1, 785, 400. 00			1, 785, 400. 00		
Hanover-Bluff unit, Wyoming	672, 560. 00		672, 560. 00	672, 560. 00			672, 560. 00		
Moon Lake, Utah	1, 592, 267. 76		1, 592, 267. 76	1, 114, 587. 42			1, 114, 587. 42	477, 680. 34	
Newlands, Nev	3, 257, 749. 35		3, 257, 749. 35	462. 552. 88	95, 000. 00		557, 552. 88	2, 700, 196. 47	
Newton, Utah	350, 000. 00		350, 000. 00	288, 750. 00			288, 750. 00	61, 250. 00	
North Platte, Nebr.-Wyo	20, 237, 552. 74	3, 653, 985. 65	23, 891, 538. 39	4, 044, 803. 50	90, 860. 00	3, 573, 835. 00	7, 709, 498. 50	16, 182, 039. 89	2, 102. 16
Ochoco, Oreg		500, 000. 00	500, 000. 00			500, 000. 00	500, 000. 00		
Ogden River, Utah	4, 734. 935. 11		4, 734, 935. 11	3, 552, 682. 88			3, 552, 682. 88	1, 182, 252. 23	
Okanogan, Wash	468, 597. 85	126, 000. 00	594, 597. 85	234, 597. 57		126, 000. 00	360, 597. 57	234, 000. 28	5, 606. 49
Orland, Calif	2, 453, 522. 15	294, 921. 83	2, 748, 443. 98	731, 487. 35	296, 940. 33	217, 040. 54	1, 245, 468. 22	1, 502, 975. 76	9, 945. 87
Owyhee, Oreg.-Idaho	19, 826, 659. 47		19, 826, 659. 47	17, 766, 370. 00			17, 766, 370. 00	2, 060, 289. 47	4, 904. 55
Palisades, Idaho	6, 403, 950. 00		6, 403, 950. 00	6, 403, 950. 00			6, 403, 950. 00		
Paonia, Colo	2, 320. 000. 00		2, 320, 000. 00	2, 320, 000. 00			2, 320, 000. 00		
Pine River, Colo	1, 500, 000. 00		1, 500, 000. 00	1, 241, 660. 00			1, 241, 660. 00	258, 340. 00	
Preston Bench, Idaho	453, 000. 00		453, 000. 00	453, 000. 00			453, 000. 00		
Provo River, Utah	19, 443, 650. 00		19, 443, 650. 00	19, 443, 650. 00			19, 443. 650. 00		
Rapid Valley, S. Dak	1, 100, 000. 00		1, 100, 000. 00	1, 000, 000. 00			1, 000, 000. 00	100, 000. 00	
Rathdrum Prairie, Idaho:									
Hayden Lake unit	118, 409. 19		118, 409. 19	95, 531. 23			95, 531. 23	22, 877. 96	
Post Falls unit	190, 000. 00		190, 000. 00	161, 500. 00			161, 500. 00	28, 500. 00	
Rio Grande, N. Mex.-Tex	10, 144, 123. 26		10, 144, 123. 26	2, 789, 520. 17	111, 592. 41		2, 901, 112. 58	7, 243, 010. 68	
Riverton, Wyo	7, 381, 827. 26		7, 381, 827. 26	6, 788, 288. 76			6, 788, 288. 76	593. 538. 50	
Salt River, Ariz	17, 482, 687. 89	6, 010, 260. 29	23, 492, 948. 18	4, 909, 043. 85	167, 796. 90	5, 632, 172. 58	10, 709, 013. 33	12, 783, 934. 85	
San Luis Valley, Colo	2, 520, 000. 00		2, 520, 000. 00	2, 520, 000. 00			2, 520, 000. 00		
Sanpete, Utah	373, 375. 94		373, 375. 94	233, 150. 25	2, 375. 00		235, 525. 25	137, 850. 69	
Scofield, Utah	247, 000. 00		247, 000. 00	172. 800. 00			172, 800. 00	74, 200. 00	
Shoshone, Wyo.-Mont	6, 827, 609. 52	380, 000. 00	7, 207, 609. 52	4, 293, 778. 98	6, 964. 28	380, 000. 00	4, 680, 743. 26	2, 526, 866. 26	
Strawberry Valley, Utah	3, 349, 423. 92		3, 349, 423. 92	825, 018. 74			825, 018. 74	2, 524, 405. 18	
Sun River, Mont.:									
Fort Shaw division	404, 771. 91	40, 000. 00	444, 771. 91	74, 005. 21		40, 000. 00	114, 005. 21	330. 766. 70	
Greenfields division	9, 555, 084. 41		9, 555, 084. 41	8, 373, 814. 24			8, 373, 814. 24	1, 181, 270. 17	
Truckee storage, Nev	1, 000, 000. 00		1, 000, 000. 00	699, 660. 42			699, 660. 42	300, 339. 58	
Tucumcari, N. Mex	5, 901, 896. 86		5, 901, 896. 86	5, 886, 611. 58			5, 886, 611. 58	15, 285. 28	

TABLE 16.—*Repayment contracts—matured and unmatured—June 30, 1955*—Continued

Project and State	Value of repayment contracts			Unmatured charges				Repayment contracts matured	Due and unpaid
	Construction	Rehabilitation and betterment	Total	Construction water-right charges unmatured	Water-right charges deferred and unmatured	Rehabilitation and betterment charges unmatured	Total unmatured		
Umatilla, Oreg	$1, 106, 482. 46	$25, 000. 00	$1, 131, 482. 46	$606, 184. 01		$25, 000. 00	$631, 184. 01	$500, 298. 45	$7, 813. 12
Uncompahgre, Colo	6, 874, 017. 36		6, 874, 017. 36	5, 727, 181. 01			5, 727, 181. 01	1, 146, 836. 35	
Vale, Oreg	4, 971, 219. 25	51, 068. 25	5, 022, 287. 50	4, 485, 811. 25		51, 068. 25	4, 536, 879. 50	485, 408. 00	
Vermejo, N. Mex	2, 107, 943. 33		2, 107, 943. 33	2, 107, 943. 33			2, 107, 943. 33		
Weber Basin, Utah	57, 694, 000. 00		57, 694, 000. 00	57, 694, 000. 00			57, 694, 000. 00		
Weber River, Utah	2, 685, 871. 83		2, 685, 871. 83	970, 121. 94			970, 121. 94	1, 715, 749. 89	
Yakima, Wash.:									
Kennewick division	4, 809, 700. 00		4, 809, 700. 00	4, 809, 700. 00			4, 809, 700. 00		
Kittitas division	11, 225, 652. 54		11, 225, 652. 54	9, 068, 059. 72			9, 068, 059. 72	2, 157, 592. 82	
Roza division	19, 228, 100. 00		19, 228, 100. 00	18, 402, 824. 35			18, 402, 824. 35	825, 275. 65	
Storage division	3, 600, 134. 12	719, 262. 47	4, 319, 396. 59	780, 799. 25		574, 604. 94	1, 355, 404. 19	2, 963, 992. 40	
Sunnyside division	4, 187, 005. 84		4, 187, 005. 84	275, 849. 22	$51, 664. 45		327, 513. 67	3, 859, 492. 17	
Tieton division	3, 449, 113. 59		3, 449, 113. 59					3, 449, 113. 59	
Yuma, Ariz.-Calif	5, 604, 305. 50		5, 604, 305. 50	392, 833. 61	119, 929. 47		512, 763. 08	5, 091. 542. 42	156. 12
Yuma auxiliary, Calif	884, 033. 97		884, 033. 97	379, 188. 15			379, 188. 15	504, 845. 82	1, 276. 10
Grand total	702, 775, 461. 04	15, 226, 803. 30	718, 002, 264. 34	583, 496, 159. 64	2, 947, 420. 01	14, 496, 404. 57	600, 939, 984. 22	117, 062, 280. 12	94, 755. 76

COMPTROLLER

The program of internal audits and special assignments was intensified by the Comptroller to meet special requests from regional directors for financial data, and to assure that prescribed financial procedures and enunciated financial policies are being followed. Requests for specialized audit service in the field in connection with construction and operating activities reached an all-time high during the year.

Thirty-one field assignments were completed, including 12 financial audits of individual projects; 3 financial audits of water users' organizations; 10 special audits; and 6 audits of power and multipurpose operations of project units.

A financial audit and related cost allocation was performed for the Gila project, Arizona, to provide financial data required to support pending legislation and the negotiation of a contract for the repayment of construction costs.

A special audit and related cost allocation was also performed for the Garland division of the Shoshone project, Wyoming.

In connection with the Yakima project, Washington, a financial audit was performed as a preliminary to the completion of an official allocation of the costs of six reservoirs comprising the storage pool.

A financial audit and special report was completed for the Boulder Canyon project, Arizona-Nevada.

During the year internal audit performance placed emphasis on reviews of compliance with governing regulations, regular financial audits, and special work. A written audit program as a guide for examinations was published. A summary letter report now advises management of audit disclosures in advance of the audit report to facilitate remedial measures at the earliest time possible. A program of prompt issuance of audit reports established a current status in report production.

DIVISION OF ORGANIZATION AND METHODS

Secretarial delegations of authority to the Commissioner of Reclamation, and redelegations by the Commissioner to regional directors, were revised, simplified, and codified. Four brief documents replaced a large number of miscellaneous memoranda as well as 45 formal orders and numerous amendments thereto. The regions now have authority to act on a large number of routine matters which formerly required referral to Washington.

Bureau operating offices were closed to conform to the reduced workload at the following projects: All-American Canal, Calif.;

Dalton Gardens-Avondale, Idaho; Deschutes, Oreg.; and San Diego, Calif.

Under the Department's management improvement program the regions and divisions identified and initiated action to resolve 263 problems, the solution to which would improve the performance of the Bureau's work. Action was completed on about 75 percent of the problems scheduled for solution.

Under the broadened incentive awards program a total of 465 employee suggestions were evaluated during the year. Of these, 197, or 42.7 percent, were adopted. These improvements represented a tangible savings of over $120,000 to the Bureau, and the employees who were responsible for the improvements were awarded $6,430. Superior performance awards were granted to 37 employees for outstanding performance of duties.

Three employees received awards for special, specific contributions to Bureau operations which resulted in a savings of $32,103. In addition to the total dollar savings from all phases of the incentive awards program of $157,793, substantial intangible benefits were realized through improved working conditions and procedures, promotion of safety, and better employee morale.

DIVISION OF PERSONNEL

Bureau employment dropped from 10,349 full-time employees at the beginning of the year to 9,607 at the end. The decrease took place gradually as work was completed, and was largely accomplished by not filling vacancies although some necessary reduction-in-force action was carried out during the final months of 1954.

Because of the decrease in total employment only a limited amount of recruitment activity was necessary, and this was confined for the most part to lower-grade positions. The shortage of beginning engineers still continued and only a few of the vacancies in this category could be filled. Shortages also developed in certain subprofessional engineering categories. Bureau representatives visited various engineering colleges in the Western States during the year. Undergraduate engineering students were hired for summer work as student assistants and trainees.

The Central Board of Civil Service Examiners had examinations open for engineers, engineering aids, draftsmen, and construction inspectors. Three hundred and ninety-nine applications were processed and 126 placements made.

Reviews were made of classified and ungraded positions to transfer positions from the abolished crafts, protective, and custodial schedule to the general schedule and to place other positions under the wage system, which were the new requirements set up by Public Law 763. Extensive position classification review also was performed throughout the Bureau and subsequent realignment of duties and responsibilities of position requirements accomplished. In the field of wage administration, new job definitions were developed and existing definitions modified; Wage Board hearings were held and rates adjusted to conform to prevailing area wages. Annual negotiations also were held on collective-bargaining agreements with respective unions and trades councils.

DIVISION OF PROCUREMENT AND PROPERTY MANAGEMENT

Under Budget Bureau and departmental policy guidance, all functions and activities of the Bureau providing goods and services for its own use were closely examined with a view toward obtaining such products from private enterprise wherever feasible.

Real and personal property no longer needed by this Bureau was offered to other agencies of the Department this year for the first time without reimbursement in order to encourage greater utilization within the Department of property purchased from appropriated funds. It was also decided during the year to make available without charge surplus property needed locally for public health and education purposes.

During the year the Bureau made a net disposal of 891 housing units, 20 percent of its housing, after deciding that private housing was able to provide sufficient accommodations in the affected locations.

Total procurement by purchase orders and contracts of the Bureau for fiscal year 1955 approximated $14,698,000, compared with a volume of $18,577,000 for the preceding fiscal year, a decrease of about 21 percent. However, the number of purchase actions increased approximately 7½ percent, from 65,207 in fiscal year 1954, to 70,159 in fiscal year 1955. A drop in dollar volume coincident with a rise in the number of procurement actions is not unusual during a period when numerous features are changed from a construction to an operation and maintenance status. Increased use of simplified purchase methods enabled the Bureau to make the transition smoothly, as evidenced by a reduction of 10 percent in the number of personnel engaged in purchasing activities.

Passenger-carrying vehicles of the Bureau fleet were reduced during fiscal year 1955 from 1,083 to 910. During the year the Bureau was authorized to replace 47 passenger-carrying vehicles. This meant that approximately 278 additional passenger-carrying vehicles which exceeded GSA replacement standards of 6 years and 60,000 miles were operated by the Bureau. Due to the excessive age and mileage of a large part of the fleet, extreme care had to be exercised in order to maintain operating costs at a reasonable level.

Personal property with an original cost of $2,429,675 was declared excess and sold for $764,166, or 31.5 percent of cost. In fiscal year 1954 the original cost of property sold was $2,585,169, which returned $513,457, or 20 percent of cost. It is estimated that property with an original cost of about $1,750,000 will become excess during the current fiscal year.

DIVISION OF GENERAL SERVICES

The Division of General Services administers records management, library operations, correspondence, communications, publications, printing and duplicating, travel services, space management and use, and other related functions.

New procedures for mail handling resulted in reduction in postage costs by extensive use of the new post office certified mail service instead of registered mail.

The Bureau Records Service Center at Denver was closed on July 23, 1954, and most of the records were transferred to the Federal Records Center there. A master set of all shelf lists for Bureau records sent to the Federal Records Center was established in the Commissioner's office, Denver, to aid the records staff of that office in research and reference service requested by Bureau offices.

The volume of reclamation records decreased this year from 124,300 cubic feet reported on June 30, 1954, to 123,000 cubic feet on June 30, 1955. Disposition for the year totaled 13,000 cubic feet and saved over $100,000 in space and equipment. Total volume has decreased each year since 1952 when the coordinated records management program started and the volume reached a peak of 127,300 cubic feet.

Publications

A means of welding the publications activities in and out of Washington into an integrated Bureau program has been devised. The new program provides that, at the begining of each fiscal year, all Bureau offices shall submit to Washington their plans for producing important publications in the field in addition to their plans for printing at the Government Printing Office in Washington, a requirement of long standing. These plans will be reviewed in Washington where the objectives will be, in addition to an integrated program in its editorial aspects, forestalled duplications and uniformly economical production practices in field printing.

Publications submitted to Washington and printed at the Government Printing Office during this fiscal year included the sixth edition of the Concrete Manual, prepared in the Commissioner's office in Denver; three congressional documents: Michaud Flats project, Idaho (H. D. 485); Canton project, North Canadian River Basin, Oklahoma (H. D. 445); and Talent division, Rogue River Basin project, Oregon (H. D. 450); the Commissioner's Annual Report to the Secretary for the Fiscal Year Ended June 30, 1954; the leaflet, Settlement Opportunities for 1955 on Reclamation Projects; and two editions of Committee Print No. 27, The Growth and Contribution of Federal Reclamation to an Expanding National Economy.

The following publications were submitted in the 1954 fiscal year and printed this fiscal year: The booklet, The Story of Hoover Dam; the folder, Hungry Horse Dam; and two congressional documents—Colorado River Storage Project (H. D. 364), and Chief Joseph Dam Project, Washington (H. D. 374).

Two engineering monographs were published by the office of the Assistant Commissioner and Chief Engineer, at Denver, during the year. One of the monographs describes hydraulic models tests and compares the performances of the models of two dam spillways with the performances of their prototype structures. The second monograph presents an analysis of the effects of the huge mass of water impounded in Lake Mead behind Hoover Dam upon the local deformation of the earth's crust in the Lake Mead area. Four technical memoranda were published covering the subjects of stress analysis of a multiple-arch dam, impervious soils used in rolled earth dams, a 15-year report on the structural behavior of Grand Coulee Dam, and calculation of stress from strain in concrete.

Also published at Denver were the technical records on the design and construction of O'Sullivan Dam, Long Lake Dam and main canal, and equalizing reservoir dams and feeder canal—all important structures of the Columbia Basin project in Washington—and Platoro Dam, a feature of the San Luis Valley project in Colorado. Other material published included 141 laboratory reports, 252 construction and supply specifications, and 43 detailed designers' instructions for use in the operation of irrigation and power facilities.

The first edition of the Earth Manual, containing information on the use of earth materials for construction purposes, and the 11th edition of the Hydraulic and Excavation Tables, comprising computational data for use in design and construction of hydraulic structures, were virtually completed at year's end and were planned to be submitted for printing by the Government Printing Office in fiscal year 1956.

The Publications Branch at Washington, D. C., received 716 requests for publications and distributed 9,365 copies. Of this number, 128 were congressional requests for 952 publications.

Seven hundred and ninety-six films were distributed to television stations, agricultural and engineering institutions, water users' associations, organizations of farmers, conventions, foreign countries, foreign visitors, and others. The increase of 100 requests over last year was due to the increasing demand for the film, Columbia Frontier.

The Branch received 135 requests for 1,362 photographs for illustration or exhibition purposes in Bureau publications, encyclopedias, various agricultural and engineering magazines, newspapers, exhibits, lectures, etc. Requests were also received from congressional offices, visitors from other Government agencies for exhibition and publication purposes in the United States and foreign countries. Eight requests were received for 133 kodachrome slides to be used in lectures.

In response to the 4,000 requests for Bureau informational material received at Denver, more than 11,000 technical publications and informational pamphlets were distributed. Sales of Bureau publications totaled $21,575, sales approximately two-thirds of this total being made to citizens of foreign governments. Sales of publications sold for the Superintendent of Documents totaled $3,224.

LEGAL

Under the reorganization of the Solicitor's Office in the Department of the Interior, responsibility for handling legal phases of matters arising in connection with the programs and activities of the Bureau of Reclamation has been vested in the Office of Associate Solicitor, Water and Power. During the past year, the Associate Solicitor supervised the work of the Assistant Solicitor, Reclamation, who is initially responsible for all legal matters connected with the work of the Bureau. As heretofore, attorneys assigned to these tasks participated in the solution of the sundry legal problems of the Bureau of Reclamation in such varied fields as construction, supply contracts and contract administration, negotiation of repayment contracts, problems connected with the generation and disposition or purchase of electric power and energy, condemnation proceedings, tort matters, and advice on daily operations problems.

Legislation

The fiscal year 1955 included the final portion of the second session of the 83d Congress and the initial portion of the first session of the 84th Congress. The following statutes of major importance to the Bureau of Reclamation were enacted during the fiscal year:

Public Law 551 (68 Stat. 580) providing authority for the transfer of title to movable property to water users' organizations on Federal reclamation projects.

Public Law 750 (68 Stat. 1044) further extends authorities under sections 7 and 17 of the Reclamation Project Act of 1939 to January 1, 1957.

Public Law 130 (69 Stat. 244) authorizes loans to irrigation districts or other public agencies to construct distribution systems authorized to be constructed under the Federal reclamation laws.

Public Law 578 (68 Stat. 690) granting consent of Congress to a compact entered into by the States of Louisiana and Texas and relating to the waters of the Sabine River.

Public Law 97 (69 Stat. 184) granting consent of Congress to States of Arkansas and Oklahoma to negotiate and enter into a compact relating to the waters of the Arkansas River.

Litigation

Major litigation involving water and power problems during the year were:

1. *Rank* v. *Krug*, et al., the complaint in this case originally was filed in 1947 in the Superior Court of the State of California in and for the county of Fresno. Upon the motion of the Department of Justice the case was removed to the United States District Court for the Southern District of California, Northern Division. At about the same time, four other actions were filed for similar relief against the same parties. These actions also were removed to the same United States district court.

The court has jurisdiction of four of the named defendant officials of region 2 of the Bureau of Reclamation, including the regional director. A number of irrigation districts in the Friant-Kern Canal and Madera Canal areas also are defendants. The State of California, through its attorney general, and the city of Fresno are intervenors in the case. The plaintiffs also filed separate suits in the same United States district court for compensation under the Tucker Act.

All of these suits directly involve the water rights of a class alleged from time to time to comprise 1,400 landowners claimed to be affected by the operation of Friant Dam and Reservoir.

The plaintiffs claim, as a class, that they own riparian, appropriative, prescriptive, and ground-water rights to the full flow of the San Joaquin River, unrestricted by operations by the United States. For their use they seek an absolute injunction against the operation of Friant Dam and its diversion works. In the alternative, they request a regulated flow of the river to simulate the optimum conditions that a flow of 2,500 cubic feet per second would provide for downstream water users at any time that such water is available in Friant Reservoir. As a second alternative, they request a physical solution to simulate a flow of 2,000 cubic feet per second, plus the installation and operation of some 14 check dams in the river, which would cost several million dollars. As a third alternative, the plaintiffs request relief by way of "reverse condemnation," as that term is used by the California courts.

As against these pleas of the plaintiffs, the defendants have interposed a general denial and have submitted plans for physical solutions of the problems.

In early 1950, motions for a preliminary injunction and to dismiss (except as to the Tucker Act cases) were consolidated and heard at Los Angeles. Both motions were denied, except that in one of the incidental cases the motion to dismiss was granted. The decision on these motions is reported in *Rank* v. *Krug*, 90 F. Supp. 773 (1950).

During July and August 1951, further hearings were held at Fresno on a renewed motion for a preliminary injunction. The result was a stipulated order covering phases of the operation of the river for a limited period of time.

In December 1951 and January 1952, pretrial hearings were held, an order was made thereon, and the case was set for trial to begin at Fresno on January 29, 1952. The trial was concluded during July of 1953.

In the spring of 1953 an order was entered requiring certain releases from Friant Dam. The United States went into the circuit court, and in an opinion dated August 4 this order was dissolved. The basis of the decision was that the order affected property of the United States and that the United States was not a party. Subsequently during August the plaintiffs moved to join the United States as a party and to reopen the trial. The United States was joined by order of the court on September 18, 1953. The United States then applied to the circuit court for a motion to restrain further proceedings in the case and to dismiss the United States as a party. On February 1, 1954, the court denied the motion. The basis of the denial was to the effect that after such a long trial it would be premature to consider the issues raised in a special proceeding and that the issues could be considered on appeal. The case is now before the Supreme Court of the United States pending decision.

2. *In the Matter of the California Oregon Power Company*, on April 16, 1951, Copco filed an application with the Federal Power Commission for a license for its proposed Big Bend No. 2 project, identified by the Federal Power Commission as project No. 2082. The Secretary of the Interior, following his recommendation to the

Commission that the application be denied for the reasons that it might impair the rights to water of the United States, would be detrimental to irrigation and development of land in the Klamath project, and would foreclose comprehensive water resource development in the Klamath River Basin, was formally admitted as a party to the proceeding and to a companion proceeding. (Docket No. E–6390, discussed separately.)

The Presiding Examiner's Recommended Decision on project No. 2082 (October 2, 1953) recommended that Copco be granted a license subject to the condition that within 1 year the company should obtain an extension or renewal, for the 50-year term of the license, of the 1917 contract with the United States covering the operation of Link River Dam. The company filed exceptions to the recommended decision on the ground that the trial examiner erred in determining that the Commission had jurisdiction on the basis of the company's use of surplus water from a Government dam. The Department did not file exceptions but appeared at the hearing before the Commission on December 1, 1953. The purpose of the appearance was to counter statements made in Copco's exceptions negativing the water rights of the United States. On January 28, 1954, the Commission issued its opinion No. 266 affirming the recommended decision of the trial examiner. Copco's petition for a rehearing was denied. Copco appealed this decision to the United States Court of Appeals for the District of Columbia (No. 12235). While retaining jurisdiction, the court remanded the case to the Commission to obtain answers to certain questions. Copco filed a brief before the Commission with respect to these questions. At the end of the fiscal year, the Commission had not yet submitted its explanatory opinion to the court.

3. *In the Matter of the California Oregon Power Company*, this proceeding is a companion to project No. 2082 and was commenced by an order to show cause, issued November 28, 1951, to Copco by the Federal Power Commission. The order required Copco to show cause why it should not file applications for licenses for five of its existing hydroelectric plants on the Klamath River in Oregon and California.

The main issues in this proceeding are whether the Commission has licensing jurisdiction over the five plants, and, assuming that the Commission does have jurisdiction, on what particular ground it should be based. Staff counsel for the Commission contended that several bases of jurisdiction exist, among others, that the plants utilize surplus water from a Government dam.

The dam in question is the Link River Dam, constructed by Copco in 1917 pursuant to a 50-year contract between Copco and the Bureau of Reclamation. In essence, the contract provided for the construction of the Link River Dam by Copco and the transfer thereof to the United States, the operation of Link River Dam by Copco to meet certain irrigation requirements of the Klamath project, and the reduction, by Copco, of certain power rates for pumping in the Klamath project. Thus, although the primary purpose of the dam is to provide water for irrigation of the Klamath project, Copco may also make limited releases of water for the generation of power. Copco has two plants at Klamath Falls, one at Keno, Oreg., and two near Copco, Calif., all of which are operated through water releases from Link River Dam.

The Presiding Examiner's Recommended Decision on Docket No. E–6390 (October 2, 1953) holds that the Commission has jurisdiction under the Federal Power Act on grounds, among others, that the plants utilize surplus water from Link River Dam. Although originally opposing this particular ground of jurisdiction, the Secretary of the Interior did not file exceptions to the recommended decision because, in effect, the interests of the United States are protected by the condition to the license imposed in project No. 2082. Copco, however, filed exceptions and, for reasons indicated in the discussion of project No. 2082, the Department appeared at the hearing before the Commission on December 1, 1953. The Commission's decision No. 266 (January 28, 1954) affirmed the "surplus water" as a jurisdictional basis for license. Copco appealed this decision to the United States Court of Appeals for the District of Columbia (No. 12236). While retaining jurisdiction, the court remanded the case to the Commission to obtain answers to certain questions. Copco filed a brief before the Commission with respect to these questions. At the end of the fiscal year, the Commission had not yet submitted its explanatory opinion to the court.

4. *State of Arizona* v. *State of California*, *et al.*, is an action in the Supreme Court of the United States by which Arizona seeks a determination of its rights in and to the use of the waters of the Colorado River, as against such rights claimed by the defendants under the Colorado River compact, the Boulder Canyon Project Act, and the California Limitation Act. Leave to intervene was granted on December 31, 1952, on the motion of the United States, and, pursuant thereto, petition of intervention on behalf of the United States was filed December 8, 1953. Motion on behalf of the State of Nevada for leave to intervene and petition of intervention on behalf of the State of Nevada were also filed with the court during December 1953. By order of the court on June 1, 1954, the State of Nevada was granted leave to intervene. The special master appointed by the court held hearings during April 1955. His report on the motion of the California defendants to join as parties the States of New Mexico, Utah, Colorado, and Wyoming was submitted to the court shortly after the end of the fiscal year.

5. *Hudspeth County and Reclamation District No. 1* v. *Robbins, et al.* (an employee of the Bureau of Reclamation), a suit for declaratory judgment to establish the water rights of the plaintiff and to enjoin officers of the United States from impounding and diverting certain waters allegedly belonging to the district was originally filed in the District Court for Hudspeth County, Tex., and later removed to the United States District Court, Western District of Texas, El Paso Division. On the plaintiff's motion for partial summary judgment and on the defendant's motion for summary judgment, the court ordered that the relief sought by the plaintiff be denied. The case was appealed, and, following oral hearings, remanded with directions to dismiss the complaint for want of jurisdiction (213 F. (2d) 425 (1954)). On October 14, 1954, the Supreme Court of the United States denied the plaintiff's petition for a writ of certiorari (348 U. S. 833).

6. *El Paso County Water Improvement District No. 1 and the United States, et al.* v. *The City of El Paso*, was filed in the United States District Court, Western District of Texas, El Paso Division, in January 1953, to resolve a number of controversies existing between the litigants, including the extent of certain alleged water rights of the city, the validity of obligations previously entered into, the validity of conveyances of the Franklin Canal right-of-way, and obligations for maintenance of bridges. Several hearings have been held for discovery purposes. At the end of the fiscal year the case had been tried and a decision is pending.

7. Two cases, both entitled *Provo Bench Canal & Irrigation Company, et al.* v. *Linke, State Engineer, and the United States*, to review decisions of the State engineer approving applications by the United States to change the point of diversion and place of use of water acquired by the United States for the Provo River project, were tried on their merits in the District Court of the Fourth Judicial District in and for Utah County, State of Utah. The trial court decided the case adversely to the Government's position. At the close of the fiscal year the question of initiating an appeal was under consideration.

8. *Desert Beach Corporation* v. *United States Imperial Irrigation District, Coachella Valley County Water District, et al.*, was filed in the United States District Court for the Southern District of California, Central Division, in October 1953. This is an action seeking to recover $450,000 in damages to plaintiff's properties alleged to have been caused by the negligent and wrongful acts or omissions of the defendants. On April 12, 1954, an order was entered dismissing the United States from the above action on the ground that plaintiff's complaint failed to allege any specific acts of negligence by Government employees acting in the course of their employment. Motions

by the Imperial and Coachella districts for dismissal on the ground of lack of diversity of citizenship were taken under advisement by the court. On June 2, 1954, plaintiff filed its first amended complaint and the United States thereafter again moved to dismiss the action on the ground that the amended complaint fails to allege any specific act of negligence on the part of Government employees and also based on the "discretionary act" provision (28 U. S. C. A. 2680) of the Federal Tort Claims Act. On January 7, 1955, defendant districts were dismissed from the action on the ground of lack of diversity of citizenship, and defendants Does 26 to 100, stated by the complaint to be employees of the United States, were dismissed by the court on its own motion. The motion of the United States for dismissal was denied. On February 2, 1955, a stipulation was entered into that the United States need not file a responsive pleading until 10 days after demand is made therefor by the plaintiff.

9. *The Atchison, Topeka and Santa Fe Railway Company* v. *United States*, petition was filed in the court of claims in February 1954 for damages allegedly arising in connection with the construction of Elephant Butte Dam from heavy siltation and sedimentation in the San Marcial area. Answer was filed on June 9, 1954.

10. *Citizens Utilities Company* v. *E. G. Nielsen, et al.* (an employee of the Bureau of Reclamation) United States Court of Appeals for the Ninth Circuit. This is an action to enjoin and restrain the United States from doing or failing to do any act or thing which would cause or result in an interference with or disruption of the delivery of Hoover Dam electrical energy to plaintiff company under its contract for the purchase of unused Metropolitan Water District energy which terminated December 31, 1954. On December 24, 1954, a temporary restraining order and order to show cause was issued. On January 21, 1955, the complaint was dismissed on the grounds that the suit is in reality a suit against the United States, which has not consented to be sued, and that the Secretary of the Interior is an indispensable party to the action. At the same time, the temporary restraining order was quashed. On January 24, 1955, plaintiff filed its appeal to the United States Court of Appeals for the Ninth Circuit and moved for restoration and continuance of the restraining order pending appeal, which motion was denied. On June 20, 1955, the Department advised the Senate Committee on Interior and Insular Affairs that if suit is instituted in the Court of Claims and, after determination of the rights of all interested parties, final judgment is rendered favorable to the company's claims, the United States will enter into arrangements for the resumption of service.

11. Contested validation proceedings involving the Ivanhoe and Madera irrigation districts and the Santa Barbara County Water

Agency are on appeal before the Supreme Court of California, where decision is pending.

Contract Litigation

During the fiscal year the Bureau of Reclamation was involved in 15 cases in the Federal courts concerning claims totaling approximately $2,700,000 arising in connection with construction and supply contracts. Bureau of Reclamation and Solicitor's personnel participated with the Department of Justice in the defense of these cases and in negotiations of compromise settlements of several of the cases. At the end of the fiscal year, 9 cases either had been decided by the courts or settled through compromise. These 9 cases involved claims totaling approximately $2,200,000. The compromise settlements and judgment totaled about $100,000.

BONNEVILLE POWER ADMINISTRATION

William A. Pearl, *Administrator*

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FINANCIAL RESULTS OF OPERATIONS

AS A RESULT of below normal temperatures experienced throughout the Columbia River Basin area during the early months of 1955, the Administration found it necessary to curtail deliveries of interruptible power to industry. This situation lasted from the latter part of March until early May. However, the addition of 10 generating units—4 at McNary, 3 at Lookout Point, 2 at Albeni Falls and 1 at Dexter—added 443,400 kilowatts of installed capacity during the year.

These factors resulted in an increase in sales, and gross revenues kept pace with an increase of $6,748,789 or 14.9 percent, for a total of $52,066,482, largest since inception of the program. All costs of operation, including maintenance charges, interest and depreciation expense, and miscellaneous charges, were exceeded by a comfortable margin and resulted in net revenues of $8,591,305. The addition of higher cost projects plus some curtailment of sales due to below normal stream flows during the period of March to May 1955, caused a decrease in net revenues of $46,405 from the net revenues of $8,637,710 reported for fiscal year 1954.

Table I presents a combined statement of revenues and expenses for the system. The data are prepared from commercial cost accounts kept in accordance with the Federal Power Commission system of accounts prescribed for electric utilities.

TABLE I.—*Columbia River power system—condensed summary of revenues and expenses—operating projects only*

	Fiscal year 1954	Fiscal year 1955	Total to June 30, 1955
Operating revenues	$45, 317, 693	$52, 066, 482	$401, 813, 269
Expenses of operation, maintenance, etc	12, 804, 967	13, 101, 399	108, 462, 928
Provision for depreciation	11, 638, 135	14, 516, 958	80, 462, 504
Interest expense	12, 248, 197	15, 937, 409	101, 080, 450
Miscellaneous deductions, net	(11, 316)	(80, 589)	1, 727, 653
Total deductions	36, 679, 983	43, 475, 177	291, 733, 535
Accumulated net revenues from operations	8, 637, 710	8, 591, 305	110, 079, 734

Summary of Revenue

Table II summarizes by customer categories the source of revenues by fiscal years to and including 1955. The aluminum industry accounted for 32.48 percent of the revenue dollar for fiscal year 1955, while industries other than aluminum accounted for 13.10 percent, making a total of 45.58 percent of the gross revenues for the year provided by industrial customers.

TABLE II.—*Revenue by class of customers through fiscal year 1955*

Class of customer	1950 and prior	1951	1952	1953	1954	1955	Total to June 30, 1955	1955 percentage (dollar revenue)
Industry:								
Aluminum	$87,549,564	13, 523, 276	13, 376, 207	13, 545, 562	15, 944, 356	16, 909, 588	160,848,553	32. 48
Other [1]	21, 115, 345	3, 774, 798	4, 650, 425	4, 715, 747	5, 417, 177	6, 821, 850	46. 495, 342	13. 10
Publicly owned utilities	29, 021, 848	9, 947, 909	12, 973, 025	13, 882, 890	14, 882, 997	17, 601, 135	98, 309, 804	33. 81
Privately owned utilities	46, 218, 881	8, 525, 609	8, 526, 775	6, 239, 276	7, 882, 879	9, 926, 150	87, 319, 570	19. 06
Other operating revenue	4, 979, 073	417, 436	653, 714	791, 734	1, 190, 284	807, 759	8, 840, 000	1. 55
Total operating revenue	188,884,711	36, 189, 028	40, 180, 146	39, 175, 209	45, 317, 693	52, 066, 482	401,813,269	100. 00

[1] Includes sales to Federal agencies.

Sales to publicly owned utilities were 33.81 percent of the total and privately owned utilities 19.06. The balance of 1.55 percent made up other operating revenue.

Increased sales occurred in all categories. Sales to aluminum industries increased $965,232, other industries $1,404,673, publicly owned utilities $2,718,138, and privately owned utilities $2,043,271.

Repayment of Federal Investment

The gross Federal investment in the power portion of all the generating projects in operation and in related transmission facilities comprises the total of all funds appropriated and requisitioned for construction and operations, together with indirect items such as WPA expenditures and amounts transferred from other Federal agencies, plus the interest charge at 2½ percent on the unrepaid balance. As of June 30, 1955, this investment amounted to $1,368,795,219, as shown in table IV. This includes accumulated interest in the amount of $163,773,645. A summary of the interest accumulation is shown in table III.

TABLE III.—*Columbia River power system—Summary of interest on Federal investment as of June 30, 1955*

Interest during construction, to be returned during repayment period as part of the Federal investment:		
Transmission system	$5,437,289	
Bonneville Dam project	2,332,734	
Columbia Basin project	9,693,591	
Hungry Horse project	4,708,542	
McNary Dam project	17,985,302	
Albeni Falls project	980,277	
Detroit and Big Cliff	3,035,468	
Lookout Point and Dexter	3,480,401	
Subtotal		$47,653,604
Interest on costs at projects allocated to future downstream river regulation, to be returned from generation at benefitted downstream projects:		
Columbia Basin project	$13,972,760	
Hungry Horse project	769,754	
Albeni Falls project	297,077	
Subtotal		$15,039,591
Interest charged to operations:		
Transmission system	$36,814,158	
Bonneville Dam project	19,029,826	
Columbia Basin project	35,156,722	
Hungry Horse project	4,200,039	
McNary Dam project	3,486,648	
Albeni Falls project	429,530	
Detroit and Big Cliff	1,638,083	
Lookout Point and Dexter	325,444	
Subtotal		$101,080,450
Gross interest accumulation		$163,773,645

With the exception of the amounts transferred to the continuing fund, all receipts from power sales and miscellaneous sources allocated to power are deposited in the Treasury to repay the Federal investment.

As of June 30, 1955 repayments total $390,040,963, leaving an unpaid balance of $978,754,256. Of the total repaid, $197,852,576 represents payment of all current expenses since inception of the program; the remaining amount of $192,188,387 is repayment on the capital investment of $1,170,942,643 as shown in table IV.

TABLE IV.—*Columbia River power system—summary of Federal investment in operating power projects and repayment as of June 30, 1955*

	Gross investment	Repayments	Net investment
Investment in current expenses:			
Operation, maintenance, etc.	$96,772,126	$96,772,126	
Interest [1]	101,080,450	101,080,450	
Total current expenses	197,852,576	197,852,576	
Investment in capital assets:			
Electric plant inventories, etc.[2]	1,123,063,162		
Unexpended appropriations	47,879,481		
Total capital investment	1,170,942,643	192,188,387	$978,754,256
Total Federal investment	1,368,795,219	390,040,963	978,754,256

[1] The Columbia River power system does not receive appropriations for payment of interest, but imputes and includes in its accounts provisions for interest expense and returns receipts to the Treasury in repayment of such expenses.

[2] Includes interest during construction of $47,653,604, which will be repaid to the Treasury as part of capital cost of electric plant and $15,039,591 of interest charged to future downstream regulation recoverable from operations of future downstream hydroelectric plants.

Inasmuch as no increase in the basic $17.50 kilowatt-year rate will be made prior to December 1956, additional generation scheduled for future years, while increasing gross revenues, will reflect lower net revenue due to higher construction costs together with added interest and depreciation expenses for the newer projects.

If necessary, a rate adjustment may be made after approval of the Federal Power Commission effective on December 20 of the years 1956 to 1959.

A summary of plant accounts as of June 30, 1955, is shown in table V.

TABLE V.—*Columbia River power system—summary of plant accounts in operating projects as of June 30, 1955*

Project	Total	Allocation	
		Nonpower	Power
Bonneville Power Administration	$368,913,677		$368,913,677
Bonneville Dam project	86,895,909	$27,302,499	59,593,410
Columbia Basin project	487,468,408	282,287,375	205,181,033
Hungry Horse project	107,368,442	20,851,472	86,516,970
Albeni Falls project	30,396,644	291,628	30,105,016
McNary Dam project	289,865,955	25,658,691	264,207,264
Detroit and Big Cliff projects	65,643,472	24,112,941	41,530,531
Lookout Point-Dexter project	92,259,614	50,903,916	41,355,698
Total plant	1,528,812,121	431,408,522	1,097,403,599
Less: Combined reserve for depreciation			76,057,579
Total less reserve			1,021,346,020

Based on individual projects the return of power capital investment has been as follows:

Project	Power capital[1] investment	Repaid as of June 30, 1955	Percent repaid	Net power[1] investment
Bonneville Power Administration	$383, 200, 518	$94, 849, 512	24. 75	$288, 351, 006
Bonneville Dam project	59, 812, 351	22, 991, 224	38. 44	36, 821, 127
Columbia Basin project	221, 573, 779	58, 802, 897	26. 54	162, 770, 882
Hungry Horse project	87, 883, 133	4, 359, 403	4. 96	83, 523, 730
Albeni Falls project	29, 935, 243	549, 617	1. 84	29, 385, 626
McNary Dam project	257, 870, 656	8, 797, 362	3. 41	249, 073, 294
Detroit-Big Cliff project	41, 644, 652	1, 431, 187	3. 44	40, 213, 465
Lookout Point-Dexter project	41, 142, 830	407, 185	. 99	40, 735, 645
Total	1, 123, 063, 162	192, 188, 387	17. 11	930, 874, 775

[1] Exclusive of unexpended funds in U. S. Treasury.

Foregoing data on repayment of the investment are based on cost accounts maintained in accordance with the Federal Power Commission uniform system of accounts. On a statutory repayment basis, the repayment percentages are the same as in the above table for the Bonneville Power Administration and Bonneville Dam, but different for the Columbia Basin project, since in the case of the latter (1) power revenues must pay operation and maintenance costs of Grand Coulee Dam and power plant allocated to irrigation, (2) interest expense is computed at 3 percent rather than 2½ percent, and (3) other differences such as the exclusion of interest during construction in the payout accounts of the Columbia Basin project.

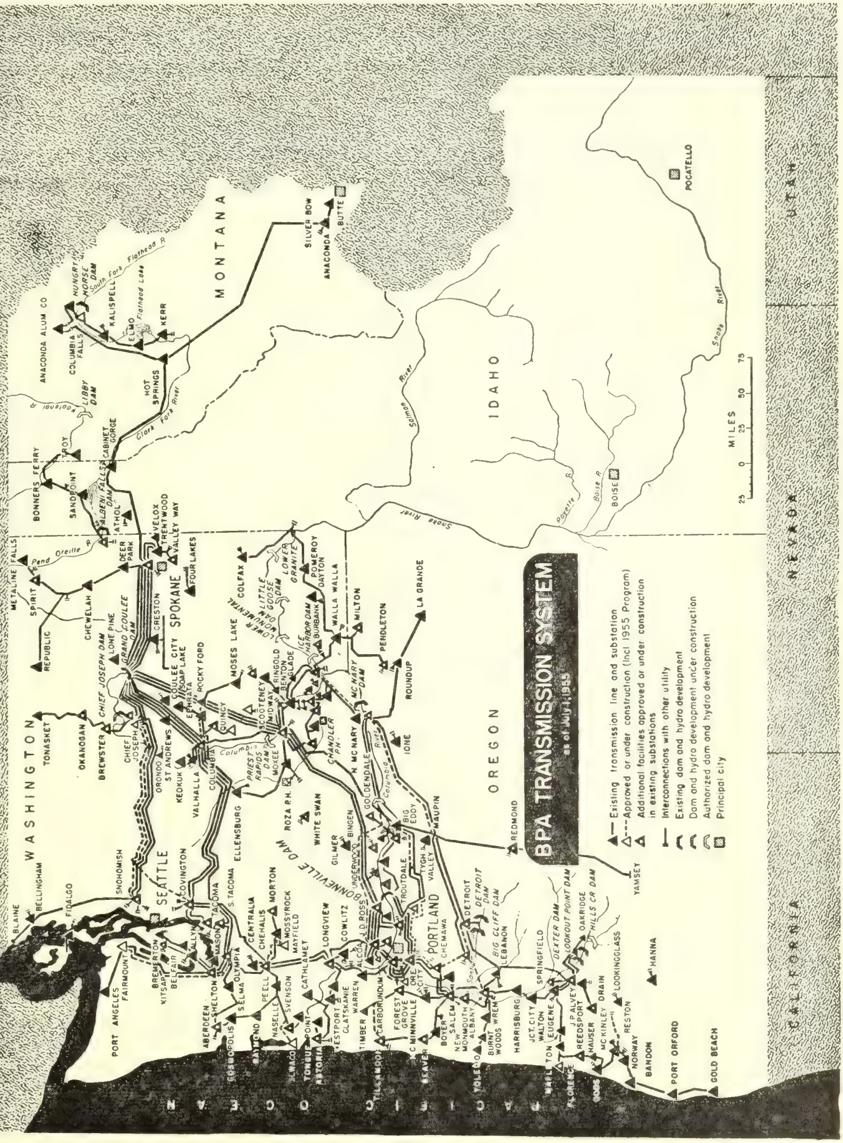
SUMMARY OF OPERATIONS

Energy Production

Energy generated at nine Federal plants for the Administration totaled 23.3 billion kilowatt-hours during fiscal year 1955. This was an increase of 15 percent over fiscal year 1954. The three new plants connected to the system during this last fiscal year were Albeni Falls, Dexter, and Lookout Point. Four new generating units at McNary were brought into production during the year.

New System Peak

A new system peak was reached for the hour 5–6 p. m. on December 27, 1954, before the two generators at Albeni Falls, the Dexter unit, and the sixth, seventh, and eighth generators at McNary were in operation. Maximum coincident demand on Bonneville, Detroit-Big Cliff, Grand Coulee, Hungry Horse, Lookout Point, and McNary plants was 3,651,000 kilowatts, an increase of 11 percent over the previous fiscal year's maximum demand of 3,301,000 kilowatts occurring during January 1954.


BPA TRANSMISSION SYSTEM
as of July 1, 1955
Existing transmission line and substation
Approved or under construction (Incl 1955 Program)
Additional facilities approved or under construction in existing substations
Interconnections with other utility
Existing dam and hydro development
Dam and hydro development under construction
Authorized dam and hydro development
Principal city
WASHINGTON
OREGON
IDAHO
MONTANA
NEVADA
UTAH
CALIFORNIA
PACIFIC OCEAN
MILES
25
0
25
50
75
SEATTLE
SPOKANE
PORTLAND
TACOMA
BONNEVILLE DAM
GRAND COULEE DAM
CHIEF JOSEPH DAM
HUNGRY HORSE DAM
LIBBY DAM
ALBENI FALLS DAM
MC NARY DAM
LOWER MONUMENTAL DAM
LITTLE GOOSE DAM
LOWER GRANITE
ICE HARBOR DAM
PRIEST RAPIDS DAM
DETROIT DAM
BIG CLIFF DAM
LOOKOUT POINT DAM
DEXTER DAM
HILLS CR DAM
BUTTE
POCATELLO
BOISE
ANACONDA
SILVER BOW
ANACONDA ALUM. CO
KALISPELL
COLUMBIA FALLS
KERR
ELMO
HOT SPRINGS
CABINET GORGE
BONNERS FERRY
SANDPOINT
TROY
METALINE FALLS
REPUBLIC
TONASKET
OKANOGAN
BREWSTER
CHEWELAH
DEER PARK
COULEE CITY
CRESTON
ELLENSBURG
MOSES LAKE
COLFAX
WALLA WALLA
PENDLETON
LA GRANDE
ROUNDUP
IONE
REDMOND
YAMSEY
THE DALLES
GOLDENDALE
BIG EDDY
CHEMAWA
SALEM
ALBANY
EUGENE
SPRINGFIELD
OAKRIDGE
HANNA
BELLINGHAM
BLAINE
FIDALGO
SNOHOMISH
COVINGTON
BREMERTON
PORT ANGELES
FAIRMOUNT
OLYMPIA
CENTRALIA
CHEHALIS
ABERDEEN
LONGVIEW
ASTORIA
TILLAMOOK
TOLEDO
FLORENCE
COOS
BANDON
PORT ORFORD
GOLD BEACH
Columbia River
Snake River
Salmon River
Clark Fork River
Pend Oreille R
Flathead Lake
Kootenai R
Boise R
Payette R

Since the fall of 1946 maximum system demands have continuously exceeded the nameplate rating of installed generators. Energy produced at Federal plants for the Administration is shown by years in table VI with peak demand and energy data in the accompanying chart. Prepared on a quarterly basis, the chart on page — shows the general trends of the Bonneville Power Administration system-load growth and development.

TABLE VI.—*Generation at Federal plants for Bonneville Power Administration, fiscal years 1939–55*

[Generation in millions of kilowatt-hours]

Fiscal years ending June 30—	Albeni Falls	Bonneville	Detroit-Big Cliff	Grand Coulee	Hungry Horse	Lookout Point-Dexter	McNary	Total for Bonneville Power Administration
1939		35						35
1940		208						208
1941		894		8				902
1942		1,807		742				2,549
1943		2,801		2,817				5,618
1944		3,489		5,751				9,240
1945		3,391		5,661				9,052
1946		2,675		3,561				6,236
1947		3,696		5,058				8,754
1948		3,992		[1] 6,894				10,886
1949		3,869		[1] 9,057				12,926
1950		3,690		[1] 10,451				14,141
1951		3,793		[1] 12,679				16,472
1952		4,463		[1] 14,092				18,555
1953		4,227	2	[1] 13,277	127			17,633
1954		4,406	[2] 425	[1] 13,886	682		797	20,196
1955	21	4,336	[2] 467	[1] 13,684	956	[2] 193	3,596	23,253
Total	21	51,772	894	117,618	1,765	193	4,393	176,656

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[1] Includes energy transferred for Bureau of Reclamation.

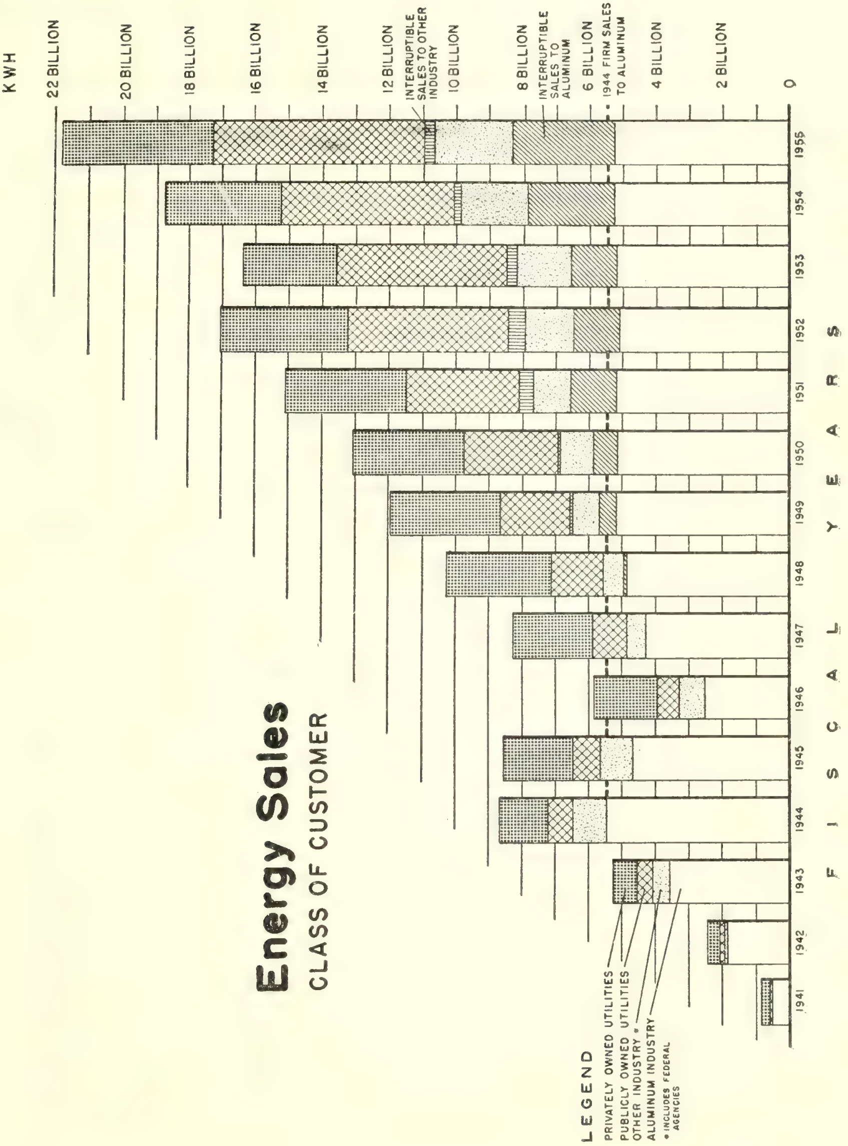
[2] Excludes energy for condenser power at Detroit and Lookout Point.

Receipts and Deliveries

Bonneville Power Administration's transmission grid forms the backbone of the interconnected transmission system of public and private utilities in the Pacific Northwest. As a result, electric energy receipts and deliveries on Bonneville's transmission system cover many complex transactions in addition to receipts from Federal power plants and deliveries by sales.

The integrated transmission grid makes possible the fullest utilization of power facilities in the area through diversity in peaking and water capabilities and diversity of system-load conditions. Substantial quantities of energy are received and delivered as transfers from other utilities.

Transactions also involve storage by the Administration in non-Federal reservoirs as well as storage by non-Federal utilities in the Grand Coulee reservoir. Disposition of energy includes deliveries from storage in Grand Coulee or to storage in other reservoirs, energy



Energy Sales

CLASS OF CUSTOMER

transfers for the Bureau of Reclamation from Grand Coulee, energy used by the Administration and energy losses in transmission and transformation.

Table VII, electric energy account, summarizes energy receipts and deliveries for fiscal year 1955.

Table VII.—Electric energy account, fiscal year ended June 30, 1955

Energy received (millions of kilowatt-hours):	
Energy generated at Federal plants for Bonneville Power Administration[1]	23,253
Power purchased and interchanged in	2,463
Total received	25,716
Energy delivered (millions of kilowatt-hours):	
Sales	21,823
Power interchanged out	2,261
Used by Administration	26
Total delivered	24,110
Energy losses in transmission and transformation	1,606
Losses as percent of total energy received ... percent	6.2
Maximum demand on generating plants (kilowatts), Dec. 27, 1954, 5–6 p. m., Pacific standard time	3,651,000
Load factor, total generated for Bonneville Power Administration ... percent	72.7

[1] For detail by plants, see table VI.

Sale of 21.8 Billion Kilowatt-Hours

Energy sales to customers of the Bonneville Power Administration totaled 21.8 billion kilowatt-hours during fiscal year 1955, an increase of 16.2 percent over the previous year.

Sales of electric energy to other utilities, both publicly and privately owned, totaled 10.8 billion kilowatt-hours, an increase of 25.3 percent. Deliveries to industrial plants and Federal agencies totaled 11 billion kilowatt-hours, an increase of 8.5 percent over the previous fiscal year.

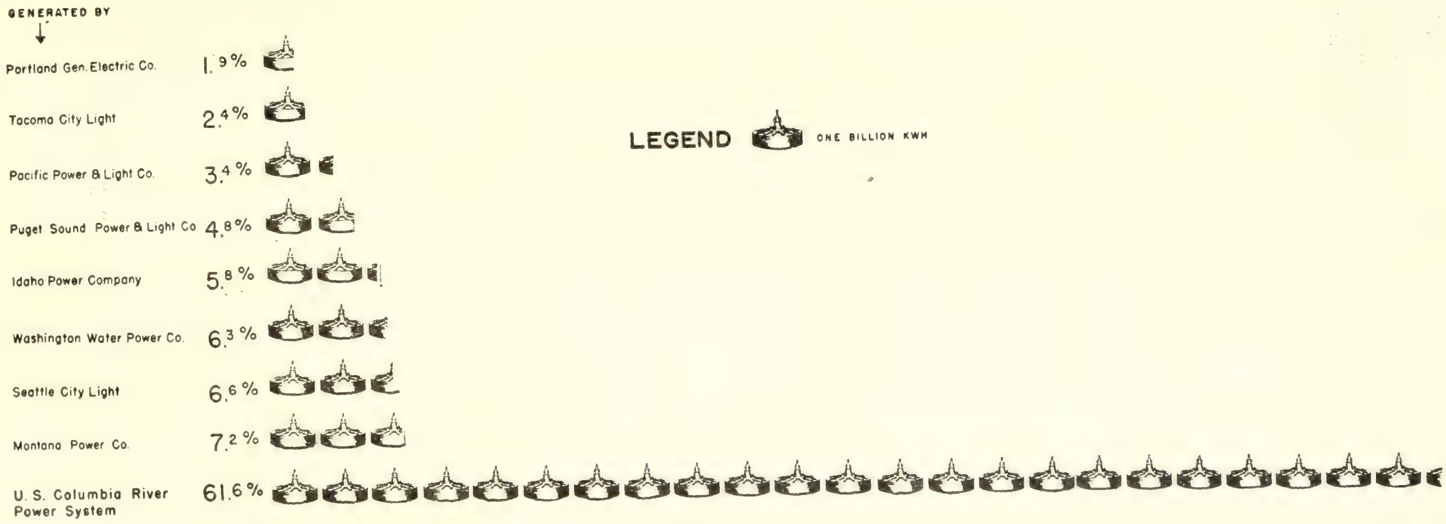
Due to favorable water conditions for most of the year, except for a short period in March, April, and May, when lack of precipitation combined with subnormal temperatures caused streamflow conditions to fall below median, it was possible for the Administration to deliver 3 billion kilowatt-hours of interruptible energy to industrial customers. This was an increase of 16.7 percent over fiscal year 1954.

Composite Average Rate of 2.39 Mills

The Administration has sold 164.5 billion kilowatt-hours of energy at a composite average rate of 2.39 mills per kilowatt-hour during the

Power Generated BY THE PRINCIPAL ELECTRIC UTILITIES OF THE PACIFIC NORTHWEST

YEAR ENDED JUNE 30, 1965



TOTAL 37.8 BILLION KWH

SOURCE: WEEKLY OPERATING REPORTS OF N. W. POWER POOL

THE ABOVE UTILITIES ARE MEMBERS OF THE NORTHWEST POWER POOL. UTAH POWER & LIGHT CO. AND BRITISH COLUMBIA ELECTRIC CO. ARE ALSO POOL MEMBERS BUT ARE NOT INCLUDED IN THIS CHART BECAUSE THEIR MAJOR SERVICE AREAS LIE OUTSIDE THE PACIFIC NORTHWEST REGION.

17 years of operation ending June 30, 1955. Sales to publicly owned utilities for this period were 35.1 billion kilowatt-hours at an average of 2.80 mills. Privately owned utilities received 37.5 billion kilowatt-hours at an average of 2.32 mills and industries 91.9 billion kilowatt-hours at an average of 2.26 mills.

Power sales to aluminum plants were 75.0 billion kilowatt-hours at an average of 2.15 mills. These plants characteristically take power at very high load factors, approaching 100 percent, which results in the exceptionally low average cost of power on the Administration's C rate schedule. Sales to industries other than aluminum, including sales to Federal agencies, were 16.9 billion kilowatt-hours at an average of 2.74 mills.

Sales by class of customer are shown in table VIII.

TABLE VIII.—*Electric energy sales by glass of customer, fiscal years 1939–55*

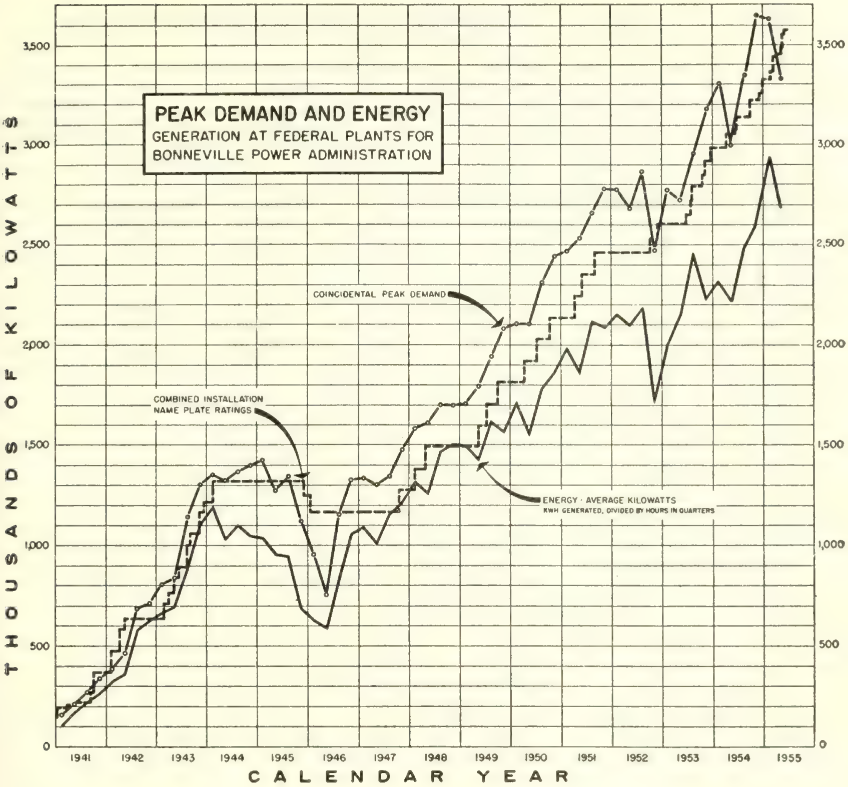
[Millions of kilowatt-hours]

Fiscal years ending June 30—	Aluminum	Other [1] industries	Publicly owned utilities	Privately owned utilities	Total
1941 and prior	523	5	35	537	1,100
1942	1,845	79	143	358	2,425
1943	3,589	507	435	739	5,270
1944	5,454	1,022	728	1,467	8,671
1945	4,667	965	824	2,057	8,513
1946	2,492	800	636	1,903	5,831
1947	4,212	627	1,045	2,378	8,262
1948	4,902	647	1,561	3,181	10,291
1949	5,666	881	2,081	3,342	11,970
1950	5,863	1,024	2,840	3,312	13,039
1951	6,545	1,538	3,414	3,579	15,076
1952	6,472	1,943	4,803	3,794	17,012
1953	6,547	1,947	5,110	2,791	16,395
1954	7,862	2,254	5,127	3,531	18,774
1955	8,352	2,624	6,274	4,573	21,823
Total to July 1, 1955	74,991	16,863	35,056	37,542	164,452

[1] Includes Federal agencies.

Rate Schedules

More than 75 percent of the energy sales for the year were made under the C–4 wholesale rate schedule at an average of 2.14 mills per kilowatt-hour. This is the kilowatt-year rate for firm power delivered anywhere from the transmission system and is also used with special measured demand provisions for sales of interruptible power. Sales are generally made under this rate to industries operating at high load factor and to utilities having substantial generating facilities. Other sales were made principally under the E schedule to utilities purchasing all or substantially all of their power requirements from the Administration. Sales under the F schedule were made to the utilities



and industries requiring power at low-load factor use, and under the H schedule for dump, exchange, or experimental purposes. A summary of energy sales for the fiscal year 1955 classified by rate schedules is shown in table IX.

On December 20, 1954, the Federal Power Commission approved amended wholesale power rate schedules and new general rate schedule provisions. The amended rates, while retaining the same type, form, and level of the supersded rates, contain several revisions for purposes of clarity and facility of application. Each of the approved wholesale power rate schedules contains a rate adjustment clause stipulating that the rate is subject to possible adjustment subject to Federal Power Commission approval on December 20, 1956, or 1957, or 1958 if such adjustment becomes necessary. In addition to the usual review of wholesale rates by the regular staff of the Bonneville Power Administration, a special independent review of the general wholesale rate structure was begun during this fiscal year by the Ford, Bacon & Davis Co.

TABLE IX.—*Electric energy sales by rate schedules, fiscal year ending June 30, 1955*

Rate schedule	Energy (thousands of kilowatt-hours)	Revenue	Mills per kilowatt-hour
C-3, C-4:			
Industries	10, 530, 159	$22, 297, 539	2. 12
Utilities	6, 019, 075	13, 056, 137	2. 17
Subtotal	16, 549, 234	35, 353, 676	2. 14
F-2, F-3, F-4:			
Industries	33, 737	169, 181	5. 01
Utilities	101, 207	440, 427	4. 35
Subtotal	134, 944	609, 608	4. 52
A-4:			
Industries	6, 147	20, 176	3. 28
Utilities	10, 882	34, 021	3. 13
Subtotal	17, 029	54, 197	3. 18
E-4: Utilities [1]	3, 794, 320	11, 787, 875	3. 11
Experimental, H-3 and exchange: Industries and utilities	1, 327, 543	3, 318, 856	2. 50
Total sales	21, 823, 070	51, 124, 212	2. 34
Reconciliation with accounting records		134, 511	
Other electric revenues		807, 759	
Total operating revenues		52, 066, 482	

[1] Including Federal agency pumping service.

Customers Served

The Administration was serving 119 customers at the end of fiscal year 1955. There were 80 publicly owned distributors of power, 18 industrial customers, 12 Federal agencies, and nine privately owned utilities. Service to two publicly owned distributors was initiated during the year: City of Port Angeles and Kennewick irrigation district. The Pend Oreille County PUD discontinued service when the District's Box Canyon plant was put into service. The Anaconda Aluminum Co. plant started receiving power from the Administration during this fiscal year. The two privately owned utilities which started receiving power from the Administration in this fiscal year are California-Pacific Utilities Co. and Idaho Power Co.

Generation Added

Additions to the United States Columbia River power system in fiscal year 1955 have a nameplate rating of 443,400 kilowatts. All units, with 135,000 kilowatts capacity, were installed at Lookout Point project on the Middle Fork of the Willamette River, including the unit at Dexter reregulating dam. Four additional units with total capacity of 280,000 kilowatts were installed at McNary project, and the first two units with 28,400 kilowatts capacity were installed at Albeni Falls project. The Corps of Engineers is construction agency for all three of these projects.

Projects Summarized

Federal projects existing, under construction, and authorized for construction by the Corps of Engineers and Bureau of Reclamation are shown in table X. With all these projects operating as a system, a nominal prime capability of 2,860,000 kilowatts is expected in fiscal year 1956 from the existing projects plus capacity to be installed during the year. With completion of the projects in construction status prime capability will be 4,000,000 kilowatts, and with completion of the authorized projects prime capability will be 6,698,000 kilowatts.

Existing usable storage capacity is 9,868,000 acre-feet. An additional 479,000 acre-feet will be provided by Cougar and Hills Creek on which construction will shortly begin, and 5,332,000 acre-feet would be provided by Libby and Green Peter projects which are authorized for construction.

All contemplated generation and storage capacity for the projects in construction status will be in service by November 1961, under the present schedule. Service dates for the other authorized projects are not scheduled as no funds are appropriated for their construction.

Non-Federal Additions

Additions to generating facilities of non-Federal utilities in the area served by the Administration for fiscal year 1955 have a nameplate rating of 45,000 kilowatts. A second unit of 25,000 kilowatts capacity was added at the city of Tacoma's steam plant No. 2; the first unit of 15,000 kilowatts capacity was installed at Box Canyon project by Pend Oreille County PUD; and a third unit of 5,000 kilowatts capacity was installed at the city of Centralia's Yelm plant. Future additions presently scheduled by non-Federal utilities in this area are shown in table XI.

Northwest Power Pool

Generation during fiscal year 1955 by the principal electric utility systems of the Pacific Northwest is shown in table XII. All of these utilities are members of the Northwest Power Pool. The Utah Power & Light Co. and the British Columbia Electric Co. are also members of the pool but are not included as their major service areas are outside the Pacific Northwest region.

The United States Columbia River power system supplied 62 percent of the total energy generated by the major utilities of the region. In addition to power requirements of industries and nonpool utilities

TABLE X.—*U. S. Columbia River power system—general specifications—projects existing, under construction and authorized-installations and capabilities correspond to a coordinated system operation*

	Location	Stream	Plant installations		Nominal prime power, kilowatts [2]	Pool elevation (feet)	Usable storage (acre-feet)	Average head (feet)	Initial date in service	Principal purpose [3]
			Number of units	Total capacity, kilowatts [1]						
Existing projects:										
Bonneville	Washington-Oregon	Columbia	10	518, 400	458, 000	72		59	June 1938	P, N.
Grand Coulee	Washington	do.	18	1, 944, 000	1, 631, 000	1, 288	5, 072, 000	326	September 1941.	P, I, FC, N.
Hungry Horse	Montana	South Fork Flathead	4	285, 000	187, 000	3, 560	2, 982, 000	364	October 1952	P, I, FC, N
Detroit	Oregon	North Santiam	2	100, 000	29, 000	1, 569	323, 000	299	July 1953	P, I, FC, N.
McNary	Washington-Oregon	Columbia	14	980, 000	548, 000	340		78	November 1953.	P, I, N.
Big Cliff	Oregon	North Santiam	1	18, 000	10, 000	1, 206		91	June 1954	P.
Lookout Point	do.	Middle Fork Willamette.	3	120, 000	36, 000	929	336, 000	228	December 1954.	P, I, FC, N.
Dexter	do.	do.	1	15, 000	12, 000	695		53	April 1955	P.
Albeni Falls	Idaho	Pend Oreille	3	42, 600	29, 000	2, 062	1, 155, 000	24	do.	P, FC, N.
				4, 023, 000	2, 940, 000		9, 868, 000			
Projects in construction status:										
Chief Joseph	Washington	Columbia	16	1, 024, 000	815, 000	946		169	September 1955.	P, I.
Chandler	do.	Yakima	2	12, 000	11, 000	620		118	November 1955.	P, I.
The Dalles	Washington-Oregon	Columbia	16	1, 119, 000	651, 000	160		87	April 1957	P, N.
Roza	Washington	Yakima	2	12, 500	6, 000	1, 221		140	May 1958	P, I.
Cougar	Oregon	South Fork McKenzie.	2	25, 000	14, 000	1, 683	188, 000	418	November 1960.	P, I, FC, N.
Ice Harbor	Washington	Snake	3	270, 000	137, 000	440		97	January 1961	P, I, N.
Hills Creek	Oregon	Middle Fork Willamette.	2	30, 000	14, 000	1, 543	291, 000	220	November 1961.	P, I, FC, N.
				2, 492, 500	1, 648, 000		479, 000			

Authorized projects:									
Libby	Montana	Kootenai	6	600,000	264,000	2,459	5,010,000	267		P, FC, N.
Lower Monumental	Washington	Snake	3	180,000	130,000	533		92		P, I, N.
Little Goose	do	do	3	195,000	139,000	633		99		P, N.
Lower Granite	do	do	3	165,000	114,000	715		80		P, N.
Priest Rapids [6]	do	Columbia	18	954,000	735,000	550	(4)	146		P, FC, N.
John Day	Washington-Oregon	do	13	1,105,000	725,000	262		101		P, I, FC, N.
Green Peter	Oregon	Middle Santiam	2	81,000	22,000	984	322,000	315		P, I, FC, N.
White Bridge	do	do	1	15,000	9,000	670		93		P.
				3,295,000	2,138,000 [5] −28,000		5,332,000			
Total, 24 projects				9,810,500	6,698,000		15,679,000			

---

[1] Nameplate rating.

[2] Average capability in a coordinated system during an 8-month storage release period (September 1936 through April 1937).

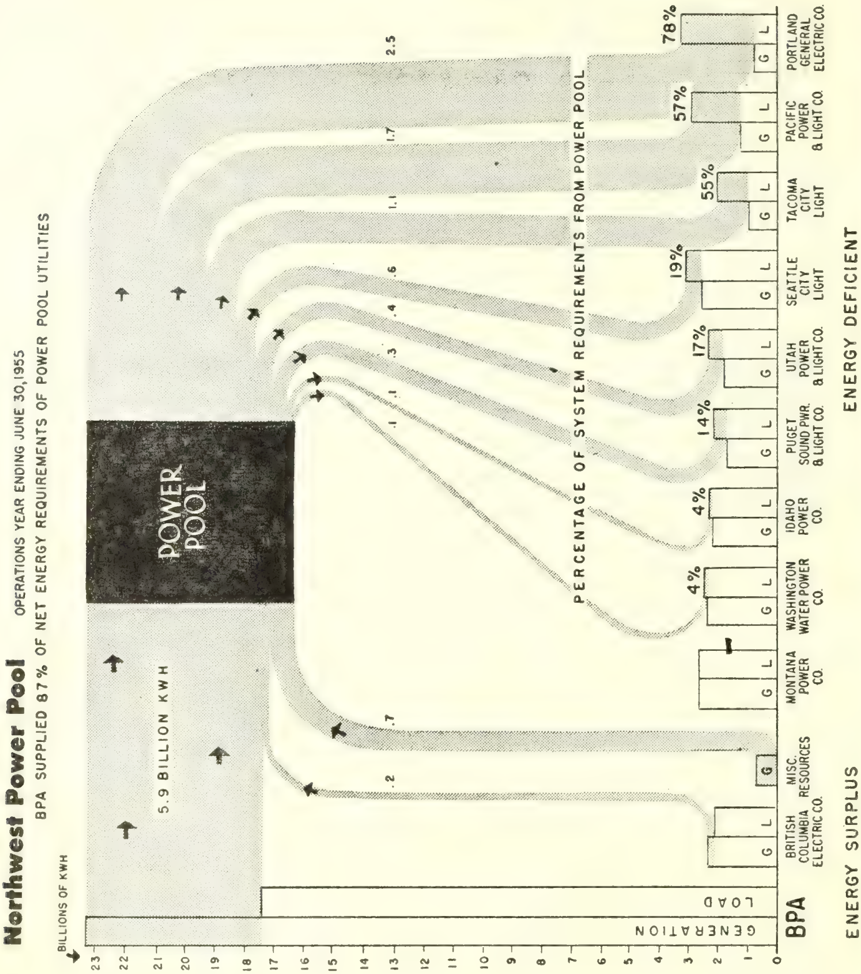
[3] P—power; I—irrigation; FC—flood control; N—navigation.

[4] Authorization provides for flood control storage of 2,100,000 acre-feet.

[5] Pumping requirements of 28,000 average kilowatts for 450,000 acres of the Columbia Basin project.

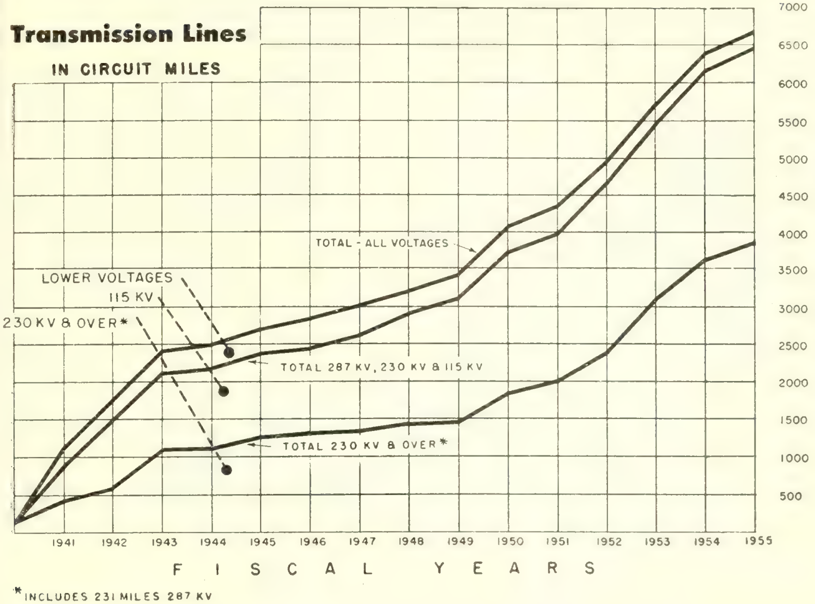
[6] Federal authorization was removed until July 27, 1956, to permit non-Federal development.

BPA—Branch of System Operations and Power Resources, Aug. 15, 1955.



Northwest Power Pool OPERATIONS YEAR ENDING JUNE 30, 1955

BPA SUPPLIED 87% OF NET ENERGY REQUIREMENTS OF POWER POOL UTILITIES



*INCLUDES 231 MILES 287 KV

Note: VOLTAGES SHOWN ARE OPERATING VOLTAGES

served through the BPA transmission system, 5.9 billion kilowatt-hours of energy was provided for use by other pool utilities to meet their requirements.

TABLE XI.—*Non-Federal utilities generator installation schedule, Aug. 1, 1955*

Utility and plant	Stream	Unit No.	Nameplate rating, thousands of kilowatts	Date in service
Pend Oreille County PUD: Box Canyon.	Pend Oreille River	4	15	October 1955.
Portland General Electric Co.: Timothy Meadows Reservoir (60,000 acre-feet).	Clackamas River		(1)	August 1956.
City of Seattle:				
Ross	Skagit River	4	90	December 1956.
Gorge (reconstruction of diversion dam).	do		(2)	December 1958.
City of Tacoma: Mayfield	Cowlitz River	1	40	January 1958.
		2	40	April 1958.
		3	40	July 1958.
		4	40	October 1958.
Washington Water Power Co.: Noxon Rapids.	Clark Fork	1	84	September 1959
		2	84	December 1959.
		3	84	March 1960.
		4	84	June 1960.

[1] Construction to be completed in November 1955 with initial filling in 1956 to add 10,500 kilowatts of prime power at downstream plants.

[2] Will increase gross head by 88 feet and peaking capability by 47,000 kilowatts.

TABLE XII.—*Generation by the principal electric utility systems of the Pacific Northwest, fiscal year 1955*

Utilities	Kilowatt-hours (billion)	Percent of total generation
Publicly owned:		
Bonneville Power Administration	23.3	61.6
Seattle City Light	2.5	6.6
Tacoma City Light	.9	2.4
Total publicly owned	26.7	70.6
Privately owned:		
Puget Sound Power & Light Co	1.8	4.8
Washington Water Power Co	2.4	6.3
Pacific Power & Light Co	1.3	3.4
Portland General Electric Co	.7	1.9
Montana Power Co	2.7	7.2
Idaho Power Co	2.2	5.8
Total privately owned	11.1	29.4
Total generation [1]	37.8	100.0

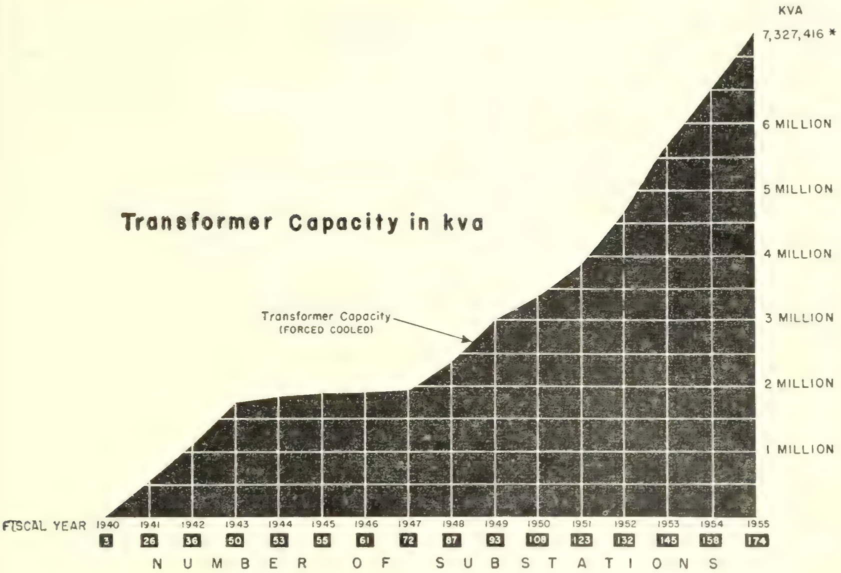
[1] The above utilities are members of the Northwest Power Pool. Utah Power & Light Co. and British Columbia Electric Co. are also members of the pool, but are not included above because their major service areas lie outside of the Pacific Northwest region.

Transmission System Additions

During the fiscal year the Bonneville Power Administration grid was increased to 6,702 circuit miles of transmission lines and to 7,327,416 kilovolt-amperes of transformer capacity. This total includes 231 circuit miles of 287,000-volt lines, 3,613 circuit miles of 230,000 volt lines, 2,627 circuit miles of 115,000 volt lines, and 231 miles of lower voltage line.

A total of 16 new substations was added to the system and the substation transformer capacity was increased by 1,174,000 kilovolt-amperes. With these additions the Administration's system includes 174 substations. Static capacitors with a capacity of 118,780 reactive kilovolt-amperes were installed, bringing the total on the system to 1,110,645 kilovolt-amperes.

To integrate the additional generation into the transmission grid and to bring it to the load centers, several major transmission lines were completed. A 90-mile section of the new McNary Dam-Vancouver, Wash., 345,000-volt line was energized at 230,000 volts in April 1955 by a temporary connection to the Midway-Big Eddy line. This line will be extended into Vancouver by the fall of 1955. In November 1954 an additional 125-mile, 230,000-volt circuit between Maupin and Albany, Oreg., was placed in operation. The operating voltage on the 231-mile Grand Coulee-Olympia line was increased from 230,000 volts to 287,000 volts in December 1954. This was accomplished by use of autotransformers on both ends of the circuit. In order to bring the generation from Lookout Point Dam into the



Transformer Capacity in kva

* INCLUDES 800,000 KVA OF AUTOTRANSFORMERS OPERATED AS PART OF TRANSMISSION LINES

Bonneville Power Administration system, a second 115,000-volt circuit was completed and placed in parallel operation with the first line between the dam and the J. P. Alvey substation.

Twelve new substations, ranging in capacity from 3,000- to 250,000-kilovolt-amperes, were energized during the fiscal year. Switching stations were completed for the Lookout Point, Albeni Falls, and Dexter Dams. Transformer capacity was increased at seven stations by the addition of transformers or forced cooling equipment to existing transformers.

New microwave facilities between Portland and the J. P. Alvey substation and expanded facilities between Portland and Snohomish substations were completed. Facilities between Portland and Spokane were placed in operation for voice communication, with work continuing on these facilities for other communication services.

The new power dispatching center in the new Interior building in Portland, Oreg., was completed; and on January 22, 1955, power dispatching was changed over from the J. D. Ross center to the Portland location.

New Construction

Major construction activity during the fiscal year was concentrated on the 345,000-volt transmission lines using 1.602-inch ACSR "Chukar" conductor for bringing power from Chief Joseph Dam to the Puget Sound area, and from McNary Dam to the Portland-Vancouver load center. To transmit additional power from McNary Dam to the Willamette Valley load centers, a second circuit 230,000-volt transmission line from McNary Dam to Santiam, Oreg., substation is under construction.

Additional communication facilities are under construction at various substations to meet the added operational requirements of the system.

SOUTHWESTERN POWER ADMINISTRATION

Douglas G. Wright, *Administrator*

☆ ☆ ☆

FOR the fiscal year 1955, Southwestern Power Administration received $2,165,000 in appropriations. After the transfer of $61,500 from SPA appropriation to the Office of the Solicitor and a transfer of $775,000 from previously appropriated funds for construction to its current appropriation, a total of $2,878,500 was available for carrying on the Administration's operation and maintenance program. This amount included $1,990,000 for the purchase of electric power and energy and for wheeling charges. Additional funds amounting to $1,458,625 remained available for completion of the Administration's construction program.

POWER RESOURCES

The installed and dependable generating capacity in the hydroelectric plants as of June 30, 1955, is shown in the following table:

Eexisting power installations

Project	River basin	Capacity	
		Installed	Dependable
Interconnected system operation:		*Kilowatts*	*Kilowatts*
Bull Shoals	White	160,000	130,000
Denison	Red	70,000	60,000
Fort Gibson	Grand	45,000	48,000
Norfork	White	70,000	63,000
Tenkiller Ferry	Illinois	34,000	30,000
Subtotal		379,000	331,000
Isolated plants:			
Narrows	Ouachita (Red)	17,000	17,000
Whitney	Brazos	30,000	28,000
Subtotal		47,000	45,000
Total		426,000	376,000

This capacity of 426,000 kilowatts will be augmented by 75,000 kilowatts when Blakely Mountain project on the Ouachita River comes into production, approximately September 1, 1955, thus increasing installed capacity to 501,000 kilowatts.

ENERGY PRODUCTION

The adverse water conditions which have existed in the SPA area since May 1952, continued through December 1954. The last 6 months of this period of low stream flow were the most critical experienced. Stream-flow conditions improved markedly in the period from January 1955 through June 1955, with the total volume of stream flow for the year near normal.

As shown in the following table, the five reservoirs of the interconnected system have had below-normal inflow for 30 months of the past 3 years. The volume of flow during the period, July 1, 1954–January 1, 1955, was less than one-half normal flow. As a result, the water levels in all projects, which were very low in June 1954, continued to recede through December 1954.

Project	Percent of median flow		
	July 1952 to July 1955	July 1954 to December 1954	July 1954 to July 1955
Bull Shoals	69	116	99
Denison	94	29	95
Fort Gibson	35	32	37
Narrows	100	138	103
Norfork	68	62	70
Tenkiller Ferry	76	42	88
Whitney	------------	27	34
Total	65	51	80

Due to the unprecedented low-flow conditions, it was necessary to defer a portion of the contract obligations of the utilities, reduce the amount of energy delivered to our customers, and purchase excess energy from the generation and transmission cooperatives in the area.

Stream-flow conditions became increasingly better after January 1, and by April 1 conditions were such that normal operations were resumed. All the pools were full by June and stream-flow conditions permitted the sale of secondary energy, and the return of some deferred energy, with a reasonable expectation of being able to return deferred energy during the summer.

Net generation within the SPA area during the 1955 fiscal year was 589,116,320 kilowatt hours, 529,827,340 kilowatt hours of which was from the interconnected system. The net generation and annual primary energy for each project is given below.

Project	Annual primary energy (kilowatt-hours) [1]	Fiscal year 1955 net generation (kilowatt-hours)
Interconnected system operation:		
Bull Shoals	414, 400, 000	241, 117, 000
Denison	140, 000, 000	140, 319, 000
Fort Gibson	[2] 78, 800, 000	70, 698, 900
Norfork	116, 000, 000	23, 744, 900
Tenkiller Ferry	[2] 51, 300, 000	53, 947, 540
Subtotal	600, 500, 000	529, 827, 340
Isolated plants:		
Narrows	18, 400, 000	29, 232, 980
Whitney [3]	33, 200, 000	30, 056, 000
Subtotal	51, 600, 000	59, 288, 980
Total	652, 100, 000	589, 116, 320

[1] Former critical period.

[2] Data from Corps of Engineers Cost Allocation Report 1955.

[3] In commercial operation June 1, 1955, energy generated from testing and irrigation releases remainder of year and sold under interim agreement.

ENERGY DELIVERIES

Southwestern Power Administration delivered power and energy to preferred customers directly over its lines and through the facilities of the Texas Power & Light Co., the Southwestern Gas & Electric Co., the Public Service Co. of Oklahoma, the Oklahoma Gas & Electric Co., the Central Electric Power Cooperative, the Western Farmers Electric Cooperative, the M & A Electric Power Cooperative, and the N. W. Electric Power Cooperative.

During the year a contract was executed and service initiated to one new preferred customer, the city of Lamar, Mo., for 500 kilowatts, and contracts were amended providing for increases in contract demand and contract obligation of 35,550 kilowatts. The increase in contract demands consisted of 3,300 kilowatts to distribution cooperatives and 100 kilowatts to one municipality. Contract obligations were increased by 32,150 kilowatts to the Federated Cooperatives through a series of interim agreements. Contracts were also amended to provide for six new points of delivery for existing preferred customers and to abandon five delivery points. In addition, service began to the Brazos Electric Power Cooperative whereby they would receive the output of the Whitney Dam project, an isolated project on the Brazos River.

At the end of fiscal year 1955, the sum of the obligations to and contract demands of all preferred customers served by SPA amounted to 223,410 kilowatts, and were comprised of the following:

	Kilowatts
Rural electric distribution cooperatives (contract demands)	33, 270
Federated cooperatives (maximum contract obligation)	151, 500
Military installations (contract demands)	9, 900
Municipalities (contract demands)	28, 740

During the fiscal year 577.3 million kilowatt-hours of electric energy were sold to preferred customers; equivalent to 103.6 percent of the total of 557.2 million kilowatt-hours of hydroelectric energy marketed by this Administration. Purchases of thermal electric energy for integration with hydroelectric energy amounted to 192.9 million kilowatt-hours, and energy purchased by the Oklahoma utility companies still deferred as to delivery at the end of the fiscal year amounted to 27.4 million kilowatt-hours, making a total of 777.5 million kilowatt-hours sold. Of this amount, 74.3 percent was sold to preferred customers. At the end of the fiscal year, the Arkansas Power & Light Co. was entitled to 217.7 million kilowatt-hours under the aluminum contract, which was deferred as to purchase and delivery.

Revenue from sales by this Administration during the fiscal year amounted to $4,063,108. This amount included sales to preferred customers of $3,049,462, and sales to private utility companies of $1,013,646.

By the end of the fiscal year, wholesale power and energy generated by the hydroelectric facilities under the marketing jurisdiction of SPA were being sold to 16 distribution cooperatives, 20 municipalities, 5 private utilities, 5 United States military installations, and 7 federated cooperatives.

CONTRACT NEGOTIATIONS

Contract negotiations were completed on an amendment to the electric service agreement between the Government and the Oklahoma Gas & Electric Co. and the Public Service Co. of Oklahoma whereby the companies will supply the supplemental requirements of Government's customers served under the Oklahoma contract through the same facilities utilized to provide electric service for the account of the Government.

Negotiations on similar arrangements were initiated with the Texas Power & Light Co. and it is expected that they will be completed in the early part of fiscal year 1956.

Contract negotiations were completed with the Arkansas Power & Light Co. for the disposal of the entire output of the Blakely Mountain Dam. Under the terms of the agreement the entire output of the project will be delivered to the company, as scheduled by the company. In return, the company will deliver to the Government on the system of the Government, as scheduled by the Government, an amount of power and energy equal to the installed capacity of the project, and all of the primary energy plus one-half of the secondary energy.

Contract negotiations were continued with five generation and transmission cooperatives in Missouri and Oklahoma on long-term arrangements to replace the lease option and power sales agreements between the cooperatives and the Government, rendered inoperative by the action of Congress in withholding funds necessary to implement the contracts. Interim contracts were made with the cooperatives to transmit Government power over the facilities of the cooperatives, to purchase certain amounts of thermal energy generated at the cooperative's steam plants, and to supply the additional power requirements of the cooperatives.

Because of the drought in the Southwestern area, a new critical water period existed for most of the reservoir projects from which this Administration markets power, which greatly curtailed the amount of power and energy available for sale. Contractual and operating arrangements were made with private utility companies in the area so as to reduce the amount of energy that this Administration was obligated to deliver to the companies during the critical water period. This action resulted in the Administration being able to fulfill all of its obligations to preferred customers without affecting service to other power customers in the area.

REORGANIZATION

As a result of a survey conducted by a team selected for that purpose, Southwestern Power Administration has undergone a reorganization and a reduction in staff during the fiscal year ended June 30, 1955. The staff now consists of 101 employees, 53 less than were employed at the beginning of the fiscal year. The organization is broken into four segments—the Office of the Administrator, the Division of Administrative Services, the Division of Operations and Engineering, and the Division of Rates and Customer Service. The reorganization is virtually complete on this date.

As a result of this reorganization and attendant changes in activities, this Administration reduced its stores and equipment by 17 percent and its leased office and warehouse and storage space by 12,778 square feet and 54,920 square feet, respectively.

FEDERAL CIVIL DEFENSE ACTIVITIES

Departmental Order 2751 designated the Administrator of Southwestern Power Administration as coordinator for all bureaus of the

Department of the Interior in the Fifth Federal Civil Defense Region (consisting of the States of Arkansas, Louisiana, New Mexico, Oklahoma, and Texas) with the Federal Civil Defense Administration on Departmental assistance in event of major disaster or other emergency situations. In this connection, SPA collected, cataloged and coordinated the Department's capabilities in this region and represented the Department in this coordinating capacity with the FCDA in the preparation for and during Operation Alert—1955.

SPA also provided counterpart service to the FCDA regional office on electric power during the alert, initiating interest and securing cooperation of interconnected power systems in the Southwestern area.

As a result of the Blackwell, Okla., tornado, which occurred on May 25, 1955, FCDA requested and Southwestern Power Administration provided engineering services in a study to determine the extent of damage and estimated cost of temporary repairs to the electric distribution of this town.

SOUTHWEST FIELD COMMITTEE

During the past year, the Southwestern Power Administration has participated with the other bureaus of the Department in the activities of the Southwest Field Committee. Through its membership on this Committee and its representation on the Inter-Agency Committee, the Southwestern Power Administration has urged consideration of present planning to meet future needs. At the request of Southwestern Power Administration, the following statement was included in the annual program report of the Southwest Field Committee:

> Comprehensive planning should provide for the inclusion of storage space to meet reasonably certain future water requirements. As a system of reservoirs approaches completion, flood storage requirements may be reduced by additional levees, channel alignment improvements, and upstream land treatment programs. In addition, the power storage may be reduced as fewer hours of hydroelectric energy will be required per kilowatt of capacity due to optimum utilization of the system to meet peaking demands. These reductions in storage requirements would permit reallocation of storage capacity to meet changing requirements for water. This would permit the realization of greater future benefits through the provision of domestic, municipal, industrial, and irrigation water supplies. For example, the authorized plan for the White River Basin has no provision for storage space in reservoirs to provide water for consumptive use although it is estimated that 2¼ million acre-feet will be required annually to meet irrigation needs. A major reallocation will eventually be required to provide storage for water for consumptive use.

The Southwestern Power Administration participated in a special meeting in the office of the Chief, Technical Review Staff, to review and comment on the program reports of the several field committees of the Department. The meeting provided the basis for improvement in such reports and in their underlying studies. The analytical review should be continued in order to improve the cooperation within the Department and to further the partnership relation between these regional representatives, interagency committees, and State and local representatives.

ARKANSAS-WHITE-RED BASINS INTER-AGENCY COMMITTEE

Representatives of the Southwestern Power Administration participated during the year with officials of the other bureaus of the Department, other Federal agencies, and the States in planning for the development of the land and water resources of the Arkansas-White-Red River Basins. The Southwestern Power Administration also participated in the work of the various subcommittees and work groups, and directed the activities of the transmission subgroup of the hydroelectric power work group.

During the past year, the activities of the Arkansas-White-Red Basins Inter-Agency Committee have been concentrated on drafting the various sections of the report, reviewing and revising these sections and the adoption of the final draft of each of the sections. During this period, representatives of the Southwestern Power Administration participated in the drafting of the Hydroelectric Power Section and in the review of the other sections in which it had a related interest. Through its membership on the Southwest Field Committee of the Department of the Interior, it has participated directly in the preparation and approval of the final sections of the Arkansas-White-Red report.

On June 28, 1955, the Arkansas-White-Red Basins Inter-Agency Committee held its final meeting and all subgroup assignments terminated as of that date. The report has been reproduced and forwarded through channels for consideration by the Inter-Agency Committee on Water Resources.

At the June 28 meeting, a charter was presented creating a new Inter-Agency Committee to continue the studies of resource development in the Arkansas-White-Red River Basin area. The Southwestern Power Administration will actively participate in the performance of the duties of the new committee.

The accomplishments of Arkansas-White-Red Basins Inter-Agency Committee during the past 5 years have shown the need for this type of organization in planning for the conservation and development in land and water resources and in encouraging a partnership between the Federal, State, and local agencies. The basic plan has been established by the old committee, and will be implemented, improved, and modified by the new committee.

LITIGATION

In *Kansas City Power & Light Company et al.* v. *McKay* (substituted) *et al.*, the District Court of the District of Columbia upheld the validity of numerous complicated contracts between Southwestern Power Administration and various rural electric cooperatives in Missouri. The plaintiffs appealed from the final judgment entered in the case. Thereafter, the Court of Appeals, District of Columbia Circuit, vacated the judgment and remanded the case to the district court with directions to dismiss the complaint. The cause is now pending on plaintiff's petition for rehearing.

In *Central Electric Power Cooperative* v. *McKay et al.*, a suit for declaratory judgment, the District Court for the District of Columbia rendered judgment for the plaintiff. The Interior Department Appropriation Act, 1954, provided for the use of a certain fund in making purchases of electric power and energy and in making payments of rentals for the use of transmission facilities. The court, contrary to the contention of the defendants, adjudged the fund to be available for use in carrying out a power purchase contract and a transmission line rental contract which the plaintiff had with the Government. The defendants appealed to the Court of Appeals, District of Columbia Circuit, which court reversed the decision of the district court and remanded the case to that court with directions to dismiss.

In *Kansas City Power & Light Company, et al* v. *N. W. Electric Power Cooperative, Inc., and Douglas G. Wright, Administrator of Southwestern Power Administration* (Docket No. 12,095, before the Public Service Commission of Missouri), six privately owned electric utility companies sought to require the cooperative to obtain a certificate of convenience and necessity for construction and operation of a thermal generating plant and transmission system in Missouri, and to require the Administrator of SPA to comply with the rules and regulations of the Commission with respect to the sale and transmission of electric power and energy in Missouri. Counsel for the Administrator of SPA appeared specially before the Commission on March 23, 1951, and moved for dismissal of the proceeding on jurisdictional grounds. Thereafter, counsel for the cooperative appeared specially and moved for dismissal on similar grounds. Briefs of the defendants and complainants were subsequently filed. Parties are still awaiting the ruling of the Commission upon these motions.

SOUTHEASTERN POWER ADMINISTRATION

Chas W. Leavy, *Administrator*

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THE hydroelectric output marketed by the Southeastern Power Power Administration in fiscal year 1955 consisted of 915,700 kilowatts of capacity and 2,130,249,513 kilowatt-hours of energy. It was sold to two public bodies, seventeen rural electric cooperatives, one Federal agency, and four privately owned utilities. The sales earned $9,783,104.81, an increase of $1,852,081.59 over earnings of the previous year, and brought revenues earned in all years to a total of $31,736,242.63.

The output was generated at seven Corps of Engineers projects. They were the Wolf Creek, Dale Hollow and Center Hill projects in Kentucky and Tennessee, the Allatoona project in Georgia, the Clark Hill project in Georgia and South Carolina, the John H. Kerr project in Virginia and North Carolina, and the Philpott project in Virginia. Generating capacity at these projects was increased during the year to an amount just beyond the 1 million mark. Construction by the corps also went forward on four other projects (Jim Woodruff in Georgia and Florida, Buford in Georgia, and Old Hickory and Cheatham in Tennessee) that are to have an installed capacity totaling more than a quarter of a million kilowatts.

The combined output of Wolf Creek, Center Hill, and Dale Hollow was sold to the Tennessee Valley Authority under a long-term contract. All power generated at Allatoona was sold under a long-term contract to the Georgia Power Co. Part of the Clark Hill output was sold under long-term contracts to two public bodies in South Carolina, and part of the Kerr projects output was sold under long-term contracts to the Virginia Electric & Power Co. and to 17 rural electric cooperatives in Virginia and North Carolina. The remainder of the Clark Hill and Kerr output, and all of the Philpott output, was sold under temporary arrangements pending the conclusion of negotiations for long-term sales. These negotiations were in progress as the year ended.

Application was made for Federal Power Commission approval of rates for the sale of Allatoona, Clark Hill, Kerr, and Philpott power. Rates for Kerr and Philpott were approved. Action by the Commission was not completed during the year on the remaining applications. Rates for the sale of Wolf Creek, Dale Hollow, and Center Hill power were reviewed with the Tennessee Valley Authority and agreement was reached on an increase in average annual payments from $3,500,000 to $3,950,000.

The Congress appropriated $233,800 for headquarters operation and maintenance, and $978,000 for the purchase of firming energy and the payment of wheeling fees. Southeastern's working force numbered 45 employees at the beginning of the year and 33 employees when the year ended.

DEFENSE ELECTRIC POWER

Office of Assistant Secretary—Water and Power Development, Department of the Interior

Fred G. Aandahl, *Assistant Secretary*

☆ ☆ ☆

PROGRAM

ACTIVITIES in the Defense Electric Power field can be summarized as follows:

General supervision of eelctric power supply expansion (including the generation, transmission, distribution and utilization thereof) to assure an adequate power supply for the Nation under partial and full mobilization conditions. In detail they include, among others: assembling and evaluating data as to the production capacity of electric utilities and the supplying of electric power under mobilization conditions; serving as an allotting agency and providing recommendations as to scheduling and expediting, to assure delivery of materials and equipment to the electric power industry for the power expansion program to provide power to Atomic Energy Commission installations; recommending establishment or modification of expansion goals, and screening and making recommendations to the Office of Defense Mobilization on requests for accelerated tax amortization for electric power facilities under expansion goals established by the Office of Defense Mobilization; and conducting various activities concerned with departmental and electric power industrial functions in the event of an emergency to insure a continuity of essential electric power.

AUTHORITY

The administration of functions dealing with electric power is vested in the Secretary of the Interior under the Defense Production Act of 1950, as amended; Executive Order 10480 of August 15, 1953, as amended; and Office of Defense Mobilization Order I–13 of November 12, 1954, DMO I–7 and DMO VII–5.

POWER SUPPLY

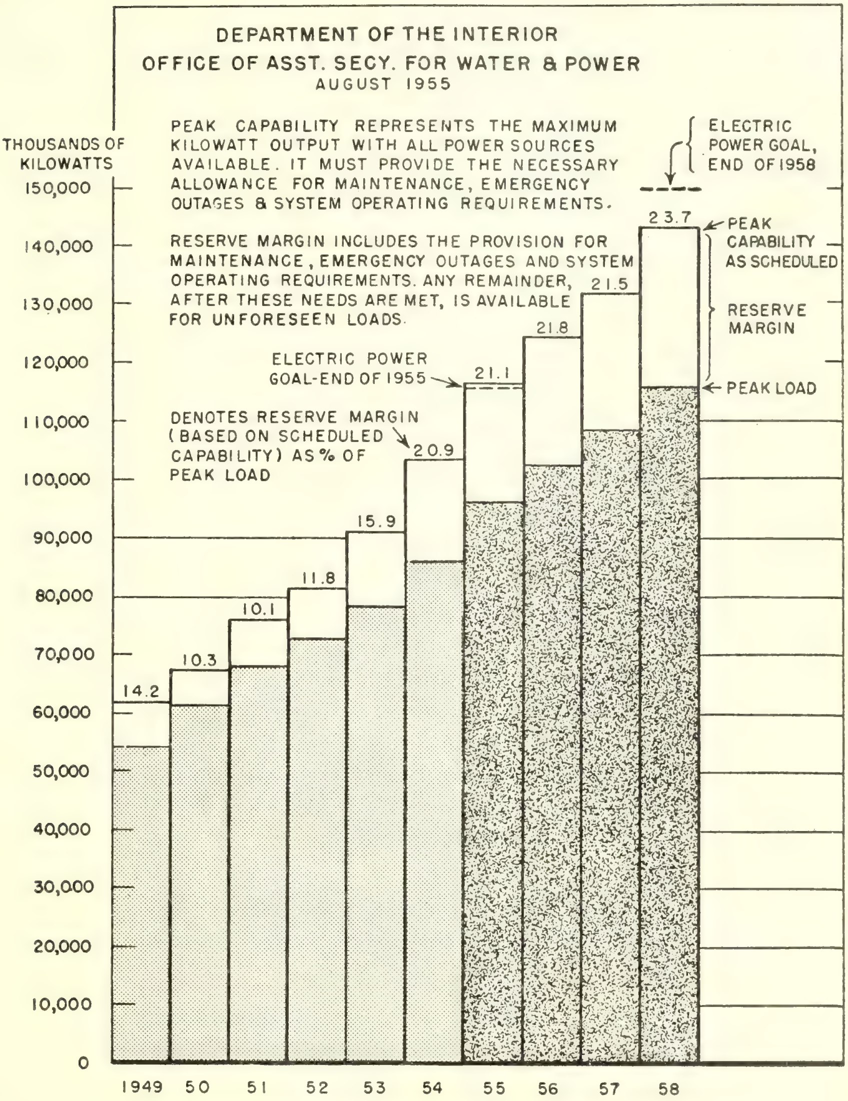
The year-end peak capabilities, peak loads, and reserve margins for the Nation as a whole are shown in table I, and graphically in exhibit A. Figures for the years 1949 through 1954 are actual, while those for the years 1955 through 1958 are as presently scheduled and planned. The capabilities reflect existing construction schedules and present plans of individual power systems for bringing new power projects into commercial operation. Present scheduling and planning indicate that there will be brought into service 13.0 million kilowatts in 1955, 8.0 million kilowatts in 1956, 7.7 million kilowatts in 1957, and 11.0 million kilowatts in 1958. Scheduling for the years 1957 and 1958 is incomplete. With incentive through rapid tax amortization, additional installations can be anticipated. Without this incentive, it can be anticipated that the installation of many units will be slipped to later years and the peak capabilities as shown in table I and exhibit A will not be attained.

Table I.—*Total United States December maximum peak capabilities, peak loads and margin of reserves*

Year	Capabilities (million kilowatts)	Loads (million kilowatts)	Reserves (percent of loads)
1949 actual	61. 9	54. 2	14. 2
1950 actual	67. 7	61. 4	10. 3
1951 actual	75. 0	68. 1	10. 1
1952 actual	81. 5	72. 9	11. 8
1953 actual	91. 0	78. 5	15. 9
1954 actual	103. 6	85. 7	20. 9
1955 estimated	116. 6	96. 3	21. 1
1956 estimated	124. 6	102. 3	21. 8
1957 estimated	132. 3	108. 9	21. 5
1958 estimated	143. 3	115. 8	23. 7

The Federal Power Commission and the Department of Interior have concurred in the estimated capability figures as shown above. Department of Interior figures include both scheduled and planned units, whereas Federal Power Commission's capacity figures include only firm scheduled units based on adverse water conditions.

The year-end peak capabilities for the Nation as a whole for the years 1955 through 1958 are based upon median hydro conditions. For adverse hydro conditions the reserve margins above estimated peak loads are less. Table II summarizes the nationwide reserve in terms of percentage of capacity in reserve above the estimated peak loads under adverse hydro conditions, as reported by the Federal Power Commission, the Edison Electric Institute, and the Defense Electric Power Staff. The differences are due to the date of reporting and the units included. The Federal Power Commission include



DEPARTMENT OF THE INTERIOR
OFFICE OF ASST. SECY. FOR WATER & POWER
AUGUST 1955

PEAK CAPABILITY REPRESENTS THE MAXIMUM KILOWATT OUTPUT WITH ALL POWER SOURCES AVAILABLE. IT MUST PROVIDE THE NECESSARY ALLOWANCE FOR MAINTENANCE, EMERGENCY OUTAGES & SYSTEM OPERATING REQUIREMENTS.

RESERVE MARGIN INCLUDES THE PROVISION FOR MAINTENANCE, EMERGENCY OUTAGES AND SYSTEM OPERATING REQUIREMENTS. ANY REMAINDER, AFTER THESE NEEDS ARE MET, IS AVAILABLE FOR UNFORESEEN LOADS.

TOTAL U.S. DECEMBER PEAK CAPABILITIES, PEAK LOADS AND RESERVE MARGINS– MEDIAN HYDRO CONDITIONS

EXHIBIT "A"

as of June 30, 1955, all units definitely scheduled as reported by the utilities. The Edison Electric Institute include as of April 15, 1955, all units both definitely scheduled and tentatively planned (orders for equipment may or may not have been placed) as reported by the utilities. The Defense Electric Power Staff include as of September 1, 1955, all units definitely scheduled and tentatively planned including information from recent rapid tax amortization applications.

TABLE II.—*Nationwide reserves (percent of loads) for adverse hydro during December peaks*

End of year—	Federal Power Commission as of June 30, 1955	Edison Electric Institute as of April 15, 1955	Defense Electric Power Staff as of September 1, 1955
1955	18.8	18.9	19.0
1956	18.4	19.3	19.9
1957	16.3	18.4	19.4
1958	12.1	17.1	21.6

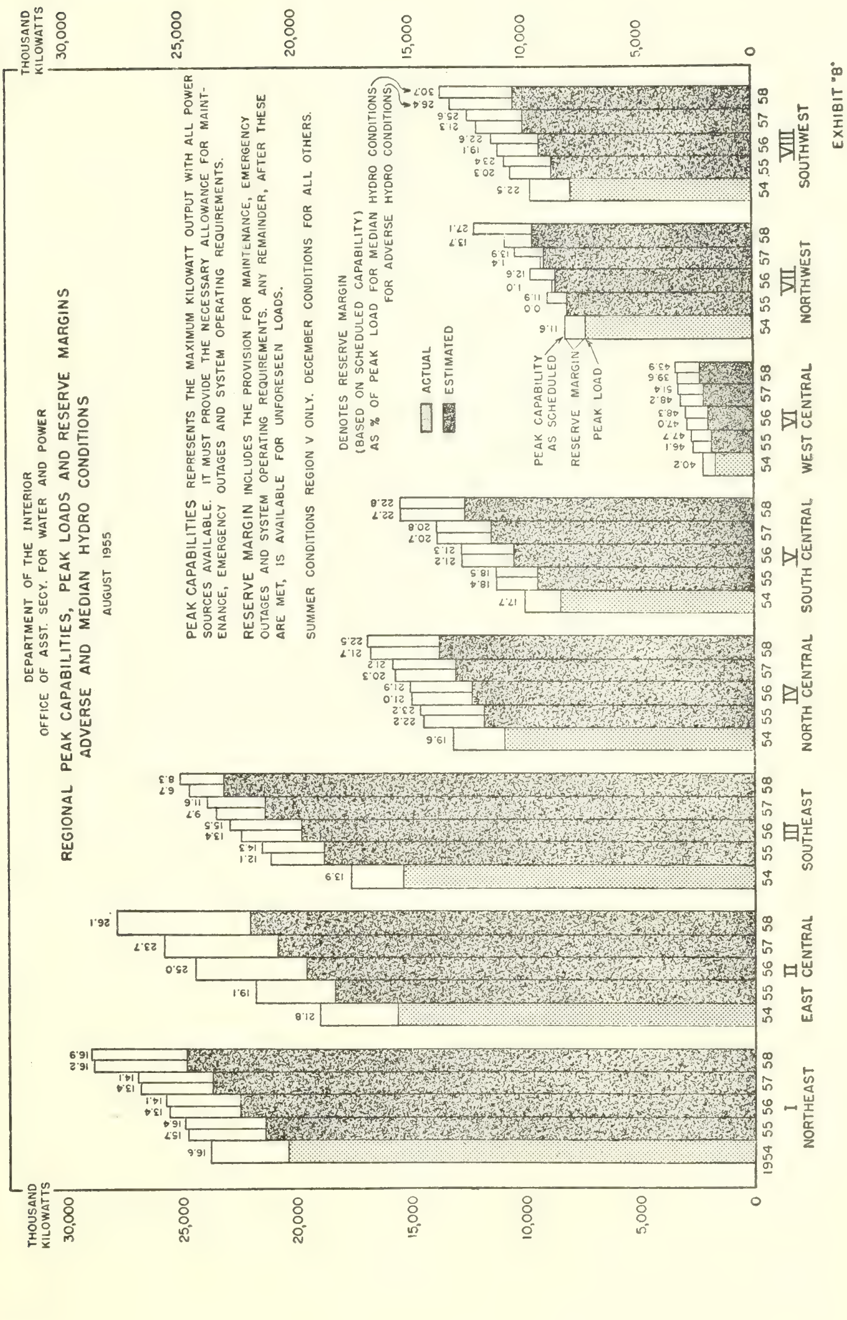
The statistics for nationwide capabilities, loads, and reserves in table I and exhibit A, do not point up the regions below national average and therefore do not reflect conditions on a regional basis, particularly indicating areas of lowest reserves. Exhibit B shows graphically the peak capabilities, peak loads and reserve margins for each of the regions I to VIII for both median and adverse hydro conditions for the years 1954 through 1958. Table III summarizes the regional reserves in terms of percentages of capacity in reserve above the estimated peak loads for both median and adverse hydro conditions. The situations shown are for year-end conditions except for region V, which is for summer conditions as this is the time of its regional peak load due to air conditioning.

TABLE III.—*Regional reserves as percentage of loads*

[December Peaks shown for all Regions except V which is for summer conditions]

Region	Median hydro				Adverse hydro			
	1955	1956	1957	1958	1955	1956	1957	1958
I	16.4	14.1	14.1	16.9	15.7	13.4	13.4	16.2
II	19.1	25.0	23.7	26.1	19.1	25.0	23.7	26.1
III	14.3	15.5	11.6	8.3	12.1	13.4	9.7	6.7
IV	23.2	21.9	21.2	22.5	22.2	21.0	20.3	21.7
V	18.5	21.3	20.8	22.8	18.4	21.2	20.7	22.7
VI	47.7	48.3	51.4	43.9	46.1	47.0	48.2	39.6
VII	11.9	12.6	13.9	[1] 27.1	0	1.0	1.4	[1] 13.7
VIII	23.4	22.6	25.6	30.7	20.3	19.1	21.3	26.4

[1] The large increase in reserves for the year 1958 is due to the scheduled and planned installation of 1,823,500 kilowatts in that year versus installation of 876,300 kilowatts in 1955, 687,500 kilowatts in 1956, and 689,700 kilowatts in 1957.



DEPARTMENT OF THE INTERIOR
OFFICE OF ASST. SECY. FOR WATER AND POWER

REGIONAL PEAK CAPABILITIES, PEAK LOADS AND RESERVE MARGINS
ADVERSE AND MEDIAN HYDRO CONDITIONS

AUGUST 1955

PEAK CAPABILITIES REPRESENTS THE MAXIMUM KILOWATT OUTPUT WITH ALL POWER SOURCES AVAILABLE. IT MUST PROVIDE THE NECESSARY ALLOWANCE FOR MAINTENANCE, EMERGENCY OUTAGES AND SYSTEM OPERATING REQUIREMENTS.

RESERVE MARGIN INCLUDES THE PROVISION FOR MAINTENANCE, EMERGENCY OUTAGES AND SYSTEM OPERATING REQUIREMENTS. ANY REMAINDER, AFTER THESE ARE MET, IS AVAILABLE FOR UNFORESEEN LOADS.

SUMMER CONDITIONS REGION V ONLY. DECEMBER CONDITIONS FOR ALL OTHERS.

DENOTES RESERVE MARGIN (BASED ON SCHEDULED CAPABILITY) AS % OF PEAK LOAD FOR MEDIAN HYDRO CONDITIONS / FOR ADVERSE HYDRO CONDITIONS

ACTUAL
ESTIMATED

EXHIBIT "B"

The scheduled and planned installations for 1958 are:

Idaho Power Co	Thermal	3 units	300,000
Do	Hydro	Brownlee No. 1	103,100
Do	do	Oxbow No. 4	43,400
Pacific Power & Light Co	do	Swift River Nos. 1, 2, 3, 4	264,000
Do	Thermal	1 unit	100,000
Portland General Electric	do	1 unit	150,000
Do	Hydro	3 units	75,000
Tacoma, Wash	do	Mayfield Nos. 1, 2, 3	120,000
U. S. Corps of Engineers	do	Chief Joseph Nos. 13, 14, 15, 16	256,000
Do	do	Dalles Nos. 3, 4, 5, 6	312,000
Utah Power & Light Co	Thermal	1 unit	100,000
Total			1,823,500

In other regions, particularly in the South and Southwest, the expanding use of air conditioning is causing summer loads that are closely approaching winter peaks. On some systems within these regions the summer loads already exceed the winter loads, although the effect is not as yet sufficient to change the regional peak from winter to summer. This general change in the characteristics of summer loads in many areas is creating additional problems with maintenance programs. Summer peaks are governed by weather conditions and cannot be closely predicted as in the case of winter peaks. Summer peaks may occur frequently throughout the summer months, making it difficult to schedule and carry out maintenance work. This situation is resulting in the need for larger reserve margins in some areas to assure the availability of adequate generating capacity to meet the more frequent peaks now occurring throughout the year.

Referring again to table II, it should be pointed out that the figures for the country as a whole under adverse hydro conditions have no special significance, as experience has shown that in the United States severe droughts are not usually experienced country-wide but are confined to limited areas. On a regional basis, adverse hydro conditions (see table III) have little effect on capability in Regions I, II, IV, V and VI. Assuming adverse hydro conditions should exist in Region III, the estimated loss in December peak capabilities would be less than two percent in 1955 and in the following years through 1958 the percentage loss would diminish. In the event of shortage of power in region III, additional power is available through transmission ties to regions II and IV on the north and V on the west. For region VII (Pacific Northwest), it is estimated that adverse hydro conditions would cause a decrease in the December capability of approximately 950,000 kilowatts in 1955 to 1,270,000 kilowatts in 1958. This represents losses varying from approximately 10.3 to 11 percent. As indicated in table III and exhibit B, this would lower the capability in 1955 to just equal to the load, but in 1956 there would result one percent reserve, in 1957—1.4 percent and in 1958—13.7 percent. As region VII capabilities are predominantly hydro rather than steam, the region needs considerably less in reserve capability than other regions. A reserve capability of 4 percent in region VII should be as adequate as a 10 percent reserve capability in region II where the capability is almost entirely from steam generation. In region VII there is also a considerable amount of contractually interruptible load. It is estimated that all noninterruptible loads can be carried without curtailment and most of the interruptible loads in 1955 through 1957. The capabilities and reserves for 1958 presently appear to be adequate. In region VIII, adverse hydro conditions would cause a decrease in estimated December peak capability ranging from 2.5 percent in 1955 to 3.3 percent in 1958. Estimated reserve margins, however, are adequate to accommodate such conditions should they be encountered.

AEC-RELATED POWER PROJECTS

The Office of the Assistant Secretary—Water and Power Development is also the allotting agency for atomic energy related projects, familiarly known as E–5 rated projects. This program provides allotments and priority assistance on materials and equipment for construction of facilities to furnish interim, firm and backup power to Atomic Energy Commission installations. It consists of 52 projects, containing 89 units with nameplate ratings totaling 10,721,000 kilowatts. These were designated as essential to supply power to Atomic Energy Commission installations. Allotments of steel, copper, and aluminum on quarterly bases are issued as required for each project. Assistance is given through expediting shipments of materials and scheduling deliveries of equipment.

Since the program started in 1953, a total of 8,738,000 kilowatts have been placed in service as of September 1, 1955. The program is presently 285,000 kilowatts behind the original schedule which was set up in November 1952. The greatest slippage was 2,319,000 kilowatts in May 1954 and large slippages continued through October 1954, at which time it amounted to 2,266,000 kilowatts. Subsequently the slippages have gradually decreased and the program is presently almost back to the original schedule. Exhibit C shows graphically the kilowatts as originally scheduled to be in service, the kilowatts as actually brought into service, and present schedule for completion of the program. The delay in the program was due principally to slippages in some turbine deliveries. The delay in the program resulted in the Atomic Energy Commission purchasing interim power from whatever sources available at higher costs than would have been necessary if the E–5 rated units had been brought into service as originally scheduled. Under present planning the program will be completed by June 1956 with total installation of 10,721,000 kilowatts.

EXPANSION GOALS

The Electric Power Goal No. 55, as revised and issued on August 26, 1952, called for the installation of 41 million kilowatts of new generating capacity in class I utility systems or a total of 116 million kilowatts by the end of 1955 and 1 million kilowatts for certain defense related projects in 1956. Present indications are that the total installed capacity by the end of 1955 will slightly exceed 116 million kilowatts.

On December 3, 1953, the Office of Defense Mobilization by its order VII–6 temporarily placed the electric power goal on the suspended list.

On July 29, 1954, the Acting Secretary of the Interior recommended to the Office of Defense Mobilization that the goal be closed with certain minor exceptions. This recommendation was made in response to a request by ODM for a reexamination of the power situation. Under the then-assumed circumstances of partial mobilization it was considered that reserve margins were sufficient to meet the needs in all regions with the possible exception of the Pacific Northwest.

Present estimates now indicate that the reserve capacity, assuming the same conditions and circumstances as above, will, for the years 1955 through 1958, be in excess of 20 percent which is considered more than adequate under partial mobilization conditions.

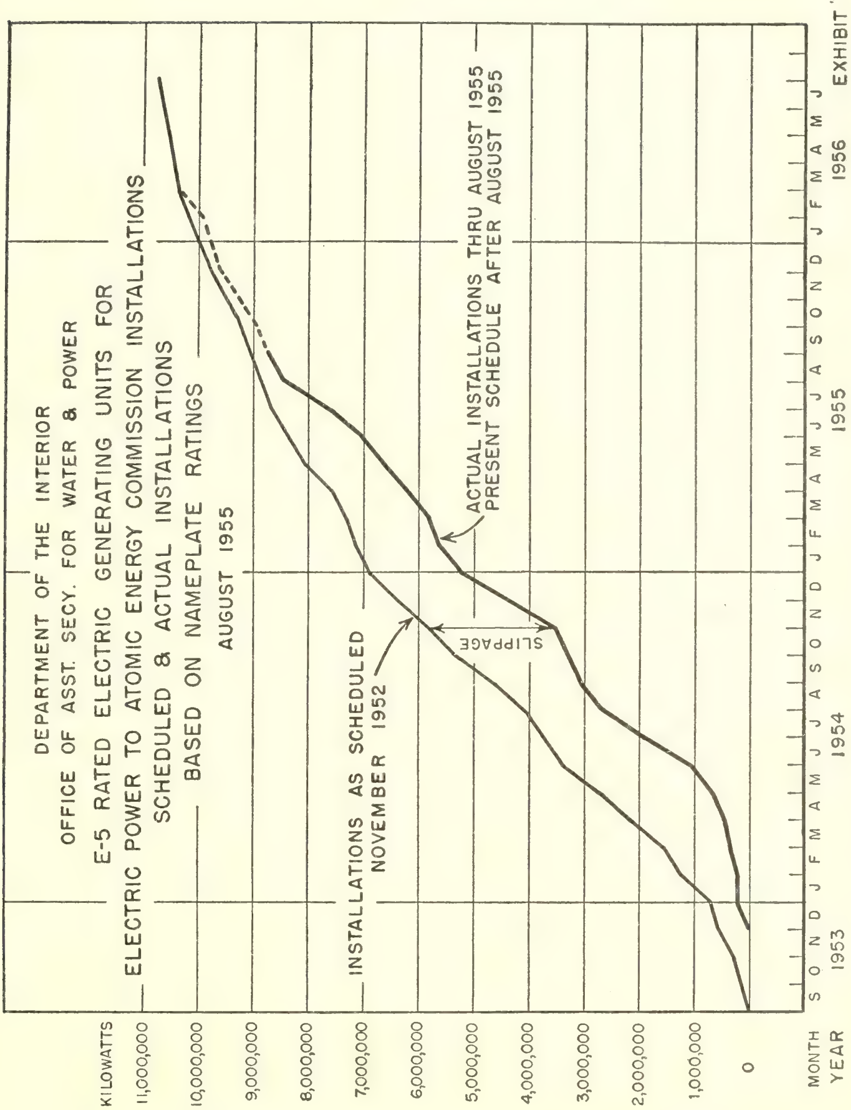
However, during conferences in March and early April of this year between officials of ODM and Interior, agreement was reached that planning should be premised on—not partial—but full mobilization which would then be in accord with other defense-planning agencies.

Accordingly, on April 15, ODM by its order VII–6, amendment 11, transferred goal 55—electric power—from the suspended to the open goal. This amendment also enlarged and extended the goal to 150 million kilowatts by the end of 1958. This represents an increase of approximately 34 million kilowatts over the expected capacity additions planned to be installed by the end of this year.

On August 11, 1955, goal 55—electric power—along with 37 other goals was placed on the suspended list by Defense Mobilization Order VII–6, supplement 1, pending review to determine whether adequate productive capacity exists to meet defense mobilization needs.

The Office of Defense Mobilization by its order—DMO VII–6, Supplement 3, dated September 29, 1955—placed goal 55—electric power—on the open list. Applications for necessity certificates under the electric power goal must be filed at the Office of Defense Mobilization by the close of business December 31, 1955, to be eligible for consideration.

Expansion goal No. 225, for power facilities for military, atomic energy, and defense-related needs, was established by Defense Mobi-


DEPARTMENT OF THE INTERIOR
OFFICE OF ASST. SECY. FOR WATER & POWER
E-5 RATED ELECTRIC GENERATING UNITS FOR
ELECTRIC POWER TO ATOMIC ENERGY COMMISSION INSTALLATIONS
SCHEDULED & ACTUAL INSTALLATIONS
BASED ON NAMEPLATE RATINGS
AUGUST 1955
ACTUAL INSTALLATIONS THRU AUGUST 1955
PRESENT SCHEDULE AFTER AUGUST 1955
INSTALLATIONS AS SCHEDULED
NOVEMBER 1952
SLIPPAGE
KILOWATTS
11,000,000
10,000,000
9,000,000
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
MONTH
YEAR
S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
1953
1954
1955
1956
EXHIBIT "C"

lization Order VII–6, amendment 9, dated March 17, 1955. This goal covers the following facilities for which there is an existing or prospective shortage to supply power required by the military services, Atomic Energy Commission, or a defense-related industry:

(*a*) Interconnections between power generating facilities; and (*b*) Transmission lines between a generating facility and the point of consumption required by a military service, Atomic Energy Commission, or defense-related industries.

This goal was established primarily to clear up the backlog of defense-related transmission projects which accumulated while goal 55 was on the suspended list.

Through August 31, 1955, under the original and amended goal No. 55 and goal 225, applications for certificates of necessity for rapid tax amortization have been received for 1,036 electric utility projects and 46 industrial power plants. Of these 791 utility plans and 43 industrial power plants were recommended for approval. The certificates of necessity approved by ODM are related to an increase in the Nation's electric power capacity of 24,328,455 kilowatts from electric utility systems and 777,000 kilowatts from industrial power plants.

COOPERATIVE ACTIVITIES

The Defense Electric Power functions also include cooperative activities with other governmental agencies. Some of these activities are:

(*a*) Reports to the Office of Defense Mobilization on status of goals; capabilities and loads; and special studies; (*b*) conferring with Federal Power Commission as to capabilities and loads and nationwide maps of utility systems; (*c*) reporting to Atomic Energy Commission as to status of the E–5 rated program and conferring with respect to rating of projects and expediting of materials; (*d*) conferring with Business and Defense Services Administration, Department of Commerce, relative to ratings, scheduling of equipment and issuance of directives; (*e*) conferring with the Geological Survey of the Department of the Interior with respect to mapping; and (*f*) contacts with public utilities in formulating defense plans.

FUTURE PLANNING

In addition to activities outlined above, plans are being formulated for the activation of a defense electric power agency at a relocation center in the event of an emergency and the formation of field organizations that can be activated in the event of war in order to assure a continuation of essential electric power supply. Maps and operating information as to individual electric systems are being accumulated for use in such an emergency.

PERSONNEL

This defense electric work is handled for the most part by three full-time employees. When the workload rises sharply, as it has occasionally over the past 2 years, the Department's Technical Review Staff provides additional personnel on a temporary basis. Industry consultants have also been called upon to assist. Consultants have been known for the most part to work on studies requiring specialized knowledge in power matters in particular areas of the country.

SALINE WATER CONVERSION PROGRAM

David S. Jenkins, *Director*

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IN RECENT years there has been a tremendous increase in demand for large quantities of fresh water, brought about by the continued expansion of our industries, population and agriculture. In recognition of this need and in view of the potential benefits to be gained, Congress, in 1952, authorized the saline water conversion program for an initial period of 5 years. That act (66 Stat. 328, 42 U. S. C., sec. 1951) has as its primary objective the development of economically feasible processes for converting saline water to fresh water, suitable for agricultural, industrial, municipal and other uses, to conserve and increase the water resources of the Nation. In view of initial partial success in development of improved processes and the recognized need for uninterrupted research over a longer period, the Congress extended the authorization to 1966, during 1955.

The activity was designed by the Congress to be, and is, a wholly cooperative endeavor with private scientific, educational and industrial institutions and individuals. The Department carries out the program by: (1) stimulating the interest of private and public organizations and individuals in the problem and encouraging research and development by correlating and coordinating activities in this field, and (2) conducting scientific research and development by means of federally financed grants and contracts and by a limited amount of research in Federal scientific organizations.

The research and development work is coordinated with the Department of Defense, the Atomic Energy Commission, the Civil Defense Administration, National Science Foundation, Smithsonian Institution, Department of Agriculture, Department of State, Department of Commerce, and the International Cooperative Administration. The work is coordinated with that in foreign countries, and cooperative research is carried out with a European working party and desalting of water.

Progress is being made toward the development of economically feasible processes for converting large quantities of saline water to fresh water. However, the cost obstacle is very great and overcoming it will doubtless require a number of years of both research and development. The work accomplished to date indicates that the cost objectives are being approached and it is believed they can be reached, and with continued research and development, the costs may be lowered still further.

Physical processes are being investigated by several contractors. Various aspects of the distillation process, for example, are being studied and the development of Dr. K. C. D. Hickman in conjunction with the Badger Manufacturing Co. shows considerable promise. This devise is a vapor compression still, but by utilizing agitation, reduced pressure, and thin films of water, the heat transfer coefficients have been increased severalfold over what has been considered practicable heretofore. The design of a large integrated prototype (25,000 gallons per day) is essentially complete and the fabrication of this unit is being considered.

Another promising distillation process being investigated by the Department under a contract with Nuclear Development Corp. of America utilizes extremely high temperatures and pressures to obtain a phase separation of dissolved salt from sea water at the critical region of water. Results obtained during the past year indicate that this method is feasible under static conditions. Corrosion and scaling are serious problems, however, and are being studied before proceeding further.

Still another distillation process, solar distillation, is being investigated by the Department through contractors, Dr. George O. G. Löf, Denver, Colo.; New York University; and Bjorksten Research Laboratories.

Investigations in the field of freezing as a demineralization technique are being conducted at Applied Science Laboratories, University of Washington, and Battelle Memorial Institute.

Development of demineralization processes based on some form of osmosis is being studied by several contractors. For example, the University of Florida is investigating reverse osmosis. Water is forced through a membrane by pressure, applied to the saline solution, but the salt is held back by a semipermeable membrane. Although the flow rate is small, several membranes studied will remove 90 percent or more of the salt from sea water in one pass. Research on membrane improvement and on the theory and mechanism involved is continuing.

Dr. G. W. Murphy, the State University of New York Research Foundation, under contract with the Department, has designed and developed an osmotically powered cell for demineralizing brackish water. Recent work has been concerned with improving the cell design.

A method involving solvent extracting is being investigated by the Department under contract with Texas A. and M. Research Foundation. Results to date indicate that a process of this type is technically feasible.

A promising electrical process being developed by Ionics, Inc., under contract with the Department, utilizes cation and anion permselective membranes. Following two earlier laboratory developments, exhaustive field tests on irrigation water in Arizona were recently completed with a trailer-mounted unit. Many problems were encountered before the salt content of the water was reduced from 4,600 parts per million to 350 parts per million. After completion of this 6-month test the unit will be moved to Miller, S. Dak., for operation on salty municipal water.

The results of these field tests will furnish reliable data for cost estimates, and conclusions regarding durability of components, frequency of, and reason for shutdowns, etc.

Progress made to date is sufficiently encouraging to indicate that if the activity is given sufficient time, economic processes for demineralization of sea water and brackish water may be developed.

OFFICE OF THE ASSISTANT SECRETARY MINERAL RESOURCES

Felix Edgar Wormser, *Assistant Secretary*

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THE Assistant Secretary for Mineral Resources discharges the responsibilities of the Secretary of the Interior with respect to the Department's programs in the field of the development and utilization of minerals and metals, including mineral fuels. He exercises supervision over the Geological Survey, the Bureau of Mines, the Defense Minerals Exploration Administration, the Office of Oil and Gas, the Office of Minerals Mobilization, and the Division of Geography.

The Assistant Secretary is the principal spokesman for Interior in the field of mineral affairs at the policy-making level within the Federal Government. He is the Department's liaison representative on the Council on Foreign Economic Policy, and represents the Department on the Interdepartmental Minerals Advisory Committee, and on other interdepartmental committees concerned with a broad range of mineral problems.

The office coordinates the Department's representation on the interdepartmental advisory committees that the Department of Commerce utilizes in carrying out its responsibilities under the Export Control Act of 1949. Requiring particular attention in this area during the year were situations with respect to iron and steel scrap, copper, aluminum, and nickel.

In addition to the foregoing responsibilities, the Office of Assistant Secretary, Mineral Resources, has become the principal point of contact between the Federal Government and the mineral industries. Real progress was made during the year toward the establishment of a series of industry advisory committees to assist the Department in carrying out its responsibilities in the field of minerals mobilization.

Continued progress was made during the 1955 fiscal year towards implementation of recommendations made by teams of experts that were appointed by the Secretary to survey the operations of the Bureau of Mines and the Geological Survey. Substantial improvement in the management of the Department's activities in the minerals field has resulted, and it is expected that further advances will be made as the new patterns of organization and improved operating procedures become completely established.

The final report of the President's Cabinet Committee on Minerals Policy was submitted to the President on November 30, 1954. The report was approved by the President on December 1, after discussions with the Cabinet. The Cabinet Committee was composed of the Secretary of the Interior, Chairman, the Secretary of State, the Secretary of Commerce, and the Director, Office of Defense Mobilization. The Assistant Secretary, Mineral Resources, served as the alternate member from the Department of the Interior and, in addition, organized and supervised interdepartmental staff work.

Prior to the submission of the Committee's final report, certain of the basic recommendations were discussed with the President. Of major importance among these was a recommendation designed to strengthen the mobilization base for strategic and critical materials. This received the President's immediate approval and an intensive study of lead and zinc was launched. As a result of this study long-term stockpile objectives were established for these two strategic metals and purchases were begun in June 1954. The purchase program was continued throughout the 1955 fiscal year and during this time its effectiveness as a mobilization device was thoroughly demonstrated. The program brought about an increase in national security in two directions. It increased the physical stocks of lead and zinc on hand and available for emergency needs, and at the same time strengthened the domestic lead and zinc mining industry as a component of the mobilization base. Studies of other mineral commodities were initiated during the year.

On November 12, 1954, pursuant to another recommendation of the Mineral Policy Committee, the Office of Defense Mobilization delegated to the Secretary of the Interior the responsibility for the development of preparedness measures for a comprehensive list of minerals and fuels. The Office of the Assistant Secretary, Mineral Resources took a leading part in the shaping of these delegations.

In January 1955 the Office of Minerals Mobilization was established to carry out the responsibilities included in the delegation. During the remainder of the fiscal year the newly created office in cooperation with the staffs of the Bureau of Mines and the Geological Survey, and under the direction of the Assistant Secretary, entered into intensive study of a number of pressing mineral mobilization problems.

Other important activities of the office during the 1955 fiscal year included continued participation in the Department's program of post-attack planning and participation in Operation Alert. In May and June 1955, the Assistant Secretary made an extended trip through Europe and the Middle East to gain firsthand information on the oil industries in these areas.

GEOLOGICAL SURVEY

W. E. Wrather, *Director*

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THE following brief accounts of the activities of the Geological Survey during the past 12 months tell of coordinated effort with many agencies of Government at all levels, many representatives of private industry and countless individuals.

This Nation's wealth is often attributed to the initiative shown by its citizens, to the abundance of its natural resources, and to the manner in which earth's riches are used to build a better future.

Necessary to thriving industry is the timely discovery and conservative use of metals and minerals, availability of power sources, and knowledge of water supplies. Steady growth has been a bulwark of this Nation and a principal wellspring of that growth has been the availability when needed of new knowledge concerning the location, quantity, and accessibility of these resources. This is the Survey's special contribution, the application of scientific and engineering knowledge to meet ever-increasing demands for new sources of raw materials.

To this end nearly 8,000 employees of the Survey are currently engaged in several hundred projects extending throughout the year. They are conducting mineral investigations, mapping, gaging streams, measuring underground waters, administering the mineral- and fuel-leasing laws, and at the same time developing new tools with which to accomplish better, the many contributory tasks involved. The following are summary statements for the principal Survey Divisions:

GEOLOGIC DIVISION

During fiscal year 1955, the Geologic Division continued its study of the geology of the United States and of the mineral resources of the Nation. Emphasis was continued on the development of new and improved methods of exploration for mineral resources, acceleration of geologic mapping, and cooperative geologic investigations with

Federal and State agencies, all supported by a program of basic research.

Notable during the year was the completion of new multicolor geologic maps of New Hampshire, Oklahoma, and Wyoming, all the results of cooperative investigations; completion for the Air Force of a special geologic study of the site for the Air Force Academy at Colorado Springs, Colo.; the completion in manuscript of the first (for the Jurassic system) of a series of paleotectonic maps; completion of field investigations and a core-drilling program for the Department of the Navy of its oil-shale deposits in Naval Oil-Shale Reserve No. 2 in eastern Utah; continued refinement of photogeologic techniques as an aid in more rapid and economical geologic mapping, and the training of 75 geologists in the use of such techniques; the use of gamma-ray well logging as a tool in the search for potash deposits; development of a jeep-mounted scintillation well logger, a hand portable scintillation well logger, and a liquid scintillation core scanner; development of X-ray fluorescence methods for the rapid nondestructive analyses of substances hard to analyze chemically; and the development of the Larsen method of geologic age determination to the routine service stage.

Survey geologists, in cooperation with Bureau of Mines engineers, continued to provide technical data and evaluation in the programs of the Defense Minerals Exploration Administration and the Emergency Procurement Service; geologic investigations of mineral resources in Latin America, Asia, and Africa were made for the Foreign Operations Administration; a broad program of investigation of fissionable materials resources was continued for the Atomic Energy Commission; for the 13th consecutive year investigations of terrane conditions were made for the Armed Forces; and Survey geologists continued to serve as advisers and consultants to the National Science Foundation, the Office of Defense Mobilization, and the Department of Defense.

Mineral Deposits

Field work was conducted on 84 projects in 23 States; 11 of these projects were carried out in cooperation with state agencies. Exploratory drilling was continued on the Tintic, Utah, and Mojave Desert, Calif., projects, and on the Colorado Plateau. Regional mineral resource studies were completed for the New England-New York Inter-Agency Committee.

Systematic geologic mapping and detailed studies of active and potential mining districts were continued, to determine the geologic setting of the mineral deposits and the factors controlling their distribution and localization. An important element in the value of

Geological Survey's investigations of the occurrence of mineral deposits lies in the steady, long-term accumulation of geologic data. During the past year an ore-body was discovered in the Wisconsin lead-zinc district by a mining company on a geologic structure revealed by Geological Survey mapping. Diamond drilling near New Market, Tenn., based primarily on previous Survey mapping and geologic interpretation, has extended the limits of a major zinc deposit. Geologic maps of the Globe-Miami project, Arizona, show the presence of a well-defined mineral belt and have stimulated active prospecting in parts of the belt that are concealed by younger rocks. Intensive geologic studies on the Colorado Plateau continued, resulting in the finding of new uranium deposits of significant size and the extension of known reserves of other deposits. Detailed investigation of the distribution of chemical elements in sandstone-type uranium deposits has revealed a statistical relationship between the size of the uranium deposits and their content of certain chemical elements. This method has practical application in estimating the magnitude of an ore deposit on the basis of a relatively small exposure. In addition, a photogeologic mapping program was continued, designed to provide large-scale maps of the Colorado Plateau.

Petroleum and Natural Gas

The success of continuing exploration for oil and gas requires a constant increase in the geologic knowledge of the surface and subsurface. Many of the official reports of the Geological Survey make generally available the fundamental geologic information needed in areas of potential promise. An example of such a report is Professional Paper 259 published during the year describing the geology of the Berea sandstone in an area of about 47,000 square miles in eastern Kentucky, eastern Ohio, western Pennsylvania, southeastern Virginia, and western West Virginia. This paper is a study of the paleogeography and sedimentation of the Bedford and Berea formations; it will be useful in locating drill sites that can result in the discovery of new oil and gas fields.

During the year surface mapping was conducted in New York, Alabama, Mississippi, Maryland, Virginia, Texas, Kansas, Arkansas, Montana, Wyoming, New Mexico, Oregon, California, Washington, and Utah. Subsurface mapping was done in Florida, Ohio, Mississippi, Colorado, Kansas, Arkansas, Oklahoma, North Dakota, Montana, New Mexico, and California.

Coal

Studies were made of the coal resources of the Tennessee Valley, the Missouri River Basin, and other areas where steam coal is needed to meet electric power requirements which can be only partly met by hydroelectric capacities. Coal is also being studied in older mining areas such as the Pennsylvania anthracite basins. Recent Survey investigations in the southern Anthracite field in Pennsylvania have shown that a thrust fault on the north side of the field has caused duplication of coal-bearing rocks and have directed attention to the possible presence of additional bodies of coal.

During the year summary coal resources studies were under way in Kentucky and Arkansas and completed in Alabama, Colorado, and Oklahoma. Field investigations were conducted in 12 States: Alabama, Tennessee, Kentucky, Ohio, Pennsylvania, Indiana, Arkansas, Colorado, Utah, New Mexico, Arizona, and Washington.

Oil Shale

In addition to field investigations and a core-drilling program on the oil-shale deposits of Naval Oil Shale Reserve No. 2, eastern Utah, study of the Tertiary geology and oil-shale resources of the Piceance Creek Basin between the Colorado and White Rivers, northwestern Colorado, was completed.

Engineering Geology

Engineering geology investigations of the Geological Survey are designed to provide basic geologic information for use in civil engineering works and other land-use programs. During the past year 25 field investigations were in operation in 11 States. Detailed engineering geology studies were in progress in the urban areas of San Francisco, Los Angeles, Seattle, Portland, Oregon, and Knoxville, Tenn. Geologic mapping continued in Massachusetts and Rhode Island under cooperative agreements with those States and manuscript reports were completed on two projects in the Missouri River Basin. General and specific research on landslide problems was continued at the Fort Randall reservoir, South Dakota, and in the Lake Roosevelt area, Washington. An engineering geology study along a part of the proposed Kansas Turnpike was made for the Kansas Highway Commission. In addition, foundation condition studies were made for the National Parks Service, and at Naval Ordnance installations.

General Geology

General geologic activities embrace studies in volcanology, metamorphism, tectonics, sedimentation, glaciology, surficial geology, and the geology of soils. Many of these studies are related to general mapping projects in areas where potential mineral resources are as yet unknown.

Studies of terrain and volcano hazards in the Aleutians were completed for the Department of Defense. Stratigraphic work in parts of the phosphate fields of Florida was finished. Studies of the Glacier National Park were prepared for publication, and geologic work was completed in the Great Smokies of the Appalachians, the La Sal Mountains of Utah, and Carson Desert of Nevada.

Geologists at the Hawaiian Volcano Observatory, applying seismic and direct observations, became convinced last winter that an eruption in Hawaii was imminent. Late in February, a crack on the flank of Kilauea opened up and poured forth lava that threatened villages and overran plantations, destroying the most agricultural land in a Hawaiian eruption since 1868. However, by predicting the eruption and promptly recommending measures for evacuation and protection, the geologists prevented loss of life and minimized damage to property.

Geophysics

The program of development, testing, and modification of geophysical instruments and techniques was accelerated. A jeep-mounted scintillation logger, hand-portable scintillation logger, and a liquid scintillation core scanner were developed. Shallow seismic reflection equipment developed by the Survey during the previous year was further tested and refined; the method was notably successful in locating buried river channels in Ohio. Studies of radiowave frequency propagation, induced polarization, and electromagnetic methods were also undertaken. Regional geophysical studies in the Mojave Desert and in Salt Lake and Utah Valleys, using gravity and aeromagnetic methods, are yielding valuable information on the geologic structure. Regional studies are also underway on the Colorado Plateau, as part of an investigation of the occurrence of uranium, and in the Lake Superior region in an investigation of the occurrence of iron ore. Detailed precision gravity surveys were begun in the Camaguey District, Cuba, at the request of the Emergency Procurement Service, General Services Administration, in a program to increase known reserves of refractory chromite.

Studies of the physical properties of original-state cores from the Colorado Plateau indicate that the emplacement of uranium ore in at least two terrains is related to pore-water content and permeability, and that the usefulness of resistivity methods may therefore be broadened.

Studies of the radon content of well waters in Salt Lake Valley indicate that buried faults influence the concentration of radon and that the trace of such faults may be defined by contouring the radon content of the well water.

About 70,000 traverse miles of airborne radioactivity and magnetic surveys were flown. Reconnaissance radioactivity surveys for radioactive raw materials were made in 9 States and significant results were obtained in several areas. Studies of radioactivity patterns associated with oil and gas fields and over various types of terrains and vegetative cover were begun.

Geochemistry and Petrology

Improvements continued to increase the efficiency and accuracy of analytical methods. Procedures were perfected to mechanize the screening and testing of radioactive samples submitted by the public. The rapid methods of rock analysis previously developed have been adopted in laboratories throughout the world; a revised and amplified manual of procedures has been prepared for publication. An automatic apparatus for making fluorescent tablets of samples for uranium determinations was invented, and has speeded this critical step tenfold. Spectographic methods for various elements have been made more accurate and sensitive, and statistical methods are being applied to interlaboratory comparisons to improve the uniformity in results of spectrographic analyses. X-ray fluorescence methods have been brought to a high degree of development, by which they can be applied to the rapid nondestructive analysis of substances whose chemical behavior makes their analysis difficult by older procedures. An X-ray fluorescence instrument has been developed that will satisfactory quantitative analyses of very small grains of ore minerals, so that individual particles in thin and polished sections can be compared, and the tiny samples of powdered minerals in the spindles used for X-ray diffraction identification can also be analyzed for their elementary constituents. Field tests for geochemical exploration were further developed, and a mobile spectrographic laboratory was built and used for making rapid analyses at the sites of investigation.

Fundamental studies of geochemical processes were continued, with special emphasis on the occurrence of uranium and structure of uranium minerals. Study of uranium in carbonaceous materials such as coal and petroleum yielded information about the migration and concentration of uranium. Applications of nuclear physics to geological studies were widely exploited; radiochemical methods for determining the radioactive elements in rocks, minerals, and ores were developed; distribution of isotopes of copper, zinc, uranium, and lead were made which give information on mineral formation processes and the ages of formation. Mass-spectrographic studies of the isotopes hydrogen and deuterium in natural waters have yielded information about the circulation of the atmosphere and the oceans, and about the water in glassy rocks. Radiocarbon age determinations have made possible the establishment of a reliable chronology of the Wisconsin glacial stage, have given absolute ages for dating many geologic events, for determining rates of sedimentation, erosion, and tectonic processes, and for measuring the addition of carbon dioxide to the atmosphere by recent coal combustion. The atomic pile at Oak Ridge National Laboratory was used for neutron bombardment of zircons to study their change with age, and for activation of natural copper samples to measure their isotopic ratios. Similar irradiation of coal samples was made at the Brookhaven National Laboratory, in studying the process of coal formation.

Fundamental research and development of methods for geochemical exploration work were continued, with field investigations in several mining districts and mineralized areas. Geobotanical exploration methods were investigated with particular stress on radioactive elements. The exploration methods have been made widely available by publication and by demonstration. Also they have been adopted by government and commercial organizations in several countries.

Paleontology and Stratigraphy

Many thousands of fossils from 35 States, Alaska, and 12 areas outside the continental United States were examined by specialists and the resulting information incorporated in 493 administrative reports for use in guiding the field work of other geologists and for eventual inclusion in publications by them on the geology and mineral resources of numerous areas.

Special research projects in support of strategic mineral studies such as the fissionable materials program, faunal studies of the subsurface rocks of the Williston Basin of the Dakotas and Montana, and studies of the Floridian-Bahamian carbonate province, as well as studies of a more general nature, were continued.

Work on the Jurassic, Triassic, Permian, and the Pennsylvanian paleotectonic maps is well advanced.

Geologic Investigations in Alaska

Survey efforts in Alaska continued to be directed toward the discovery and appraisal of the mineral resources of the Territory with emphasis on fuel resources for internal consumption and possible export and on strategic and critical minerals. Studies of engineering problems and investigations of construction materials constituted an increasing part of the Alaskan work.

Petroleum investigations carried out northeast of Anchorage in the Nelchina area in fiscal year 1955 included the location of evidence of an extension eastward from the Nelchina area of Lower Cretaceous sediments under the adjacent Copper River Tertiary basin and the classification of the Cretaceous rocks of the Lower Yukon-Koyukuk area into 5 mappable units. Airborne magnetometer studies were initiated in southern Alaska to obtain information on sedimentary rocks in basins potentially favorable for oil. Results of field studies in the Gulf of Alaska Tertiary province and in northern Alaska (largely financed by Navy funds) were in the process of office compilation.

Coal investigations were again concentrated in the rail belt. Geologic mapping in the Nenana coalfield was completed and comprehensive reports on the results are in preparation. Subsurface exploration by power auger was carried out at 4 localities, 2 in the Little Susitna district of the Matanuska coalfield and 2 in the Homer district of the Kenai coalfield. In addition a brief examination was made of a coal occurrence on the Beluga River 50 miles west of Anchorage.

Other specific investigations included study of the locally mineralized Lituya Bay-Lynn Canal Transverse Belt of southeastern Alaska, of the promising southern Prince of Wales Island ferrous-base metal province, of tin and tungsten deposits on the Seward Peninsula, of reported occurrences of radioactive minerals in various parts of the Territory, and a reconnaissance study in the northeastern part of the Nutzotin Mountains. Field work in connection with reconnaissance geologic investigations in the Kuskokwim area was completed by means of cooperative arrangements with the 30th Topographic Battalion, United States Army Engineers. Cooperative investigations with the National Park Service were again carried on in the Katmai National Monument. Other activities included engineering geology studies of three potential power sites near Juneau, the routes of the proposed Denali and Browne-Nenana highways, several critical problems of the Alaska Railroad, and the completion of mapping in the greater Anchorage area.

Reconnaissance surveys for fissionable materials in various parts of the Territory were carried out, contributory to which a radiometric laboratory was maintained during the prospecting season at College, Alaska. Also in progress was compilation based on existing geologic information, and supplemented by photogeologic study on geologic quadrangle maps at a scale of 1:250,000 for more than 10 percent of the Territory.

There was a continued refinement of photogeologic techniques and an expansion of their application during the year. As a result of studies to date, and including those areas studied in connection with the Navy's exploration of Navy Petroleum Reserve No. 4, more than 100,000 square miles of Alaska have been mapped photogeologically. The geologic data contained in these maps are interpreted from aerial photographs and receive only limited field checking. Their primary functions are as bases for future geologic work and as interim geologic maps until more detailed studies can be made.

Military Geology

For the 13th consecutive year, geologic investigations on rock types, soils, vegetation, and water resources have been made by the Geological Survey to provide technical advice to the Corps of Engineers and other agencies of the Armed Forces. During the past year, 41 comprehensive studies of foreign regions and 32 special technical reports and maps were produced by a staff of geologists, botanists, soil scientists, and other technicians in the Washington offices. In addition, numerous advisory consultations, briefings, and lectures were provided to military technical and intelligence personnel on military aspects of the geology in foreign, Territorial, and domestic areas.

For the third consecutive year, technical assistance was provided to United States Army Engineers in Germany and Austria. Since November 1954, a team of specialists (geologists and soil scientists) has been assigned to headquarters in Heidelberg and Salzburg for the purpose of directing and instructing military technicians in the preparation of special-purpose terrain evaluation maps. A second team of specialists has been assigned to similar duties with the Engineers in Tokyo, Japan.

In December 1954, a geologist was assigned to accompany the Navy's Atka Expedition to the Antarctic. Special observations were made for evaluation of the engineering and construction properties, uses, and limitations of shelf and continental ice.

Field studies during the year were conducted largely in the western Pacific region and in Alaska. In the Pacific, a field survey was completed on Pagan and another brought to near completion on Truk. Further military geology reports on the Palaus, Okinawa, Saipan, Tinian, and Guam were brought to near completion and readiness for publication processing. Numerous engineering geology consultations were requested by the Far East Engineer Command, mainly in the evaluation and discovery of water resources for military uses in Japan, Korea, and lesser islands of the Pacific area. Increasingly numerous requests by the military, and a greater reliance on geologic advice in engineering problems in the Pacific area, have been noted over the past few years.

A second large-scale field program, active since 1946, continued geologic and associated terrain condition studies in Arctic and Subarctic regions, particularly Alaska. During the fiscal year, field reconnaissance was conducted in three separate areas of the Copper River Basin, in the Cook Inlet area, at the Big Delta Military Reservation area, in the southwest Talkeetna Mountains, and on the north slope of the Brooks Range. Comprehensive military geologic reports are underway for these aforementioned areas and for previously investigated areas throughout Alaska. A military geology report on the Yukon Flats area was completed and submitted for publication during the next fiscal year. A special report on the geologic aspects of the Chena area was published. Close cooperation between the Alaska Road Commission and a Geological Survey party in the Copper River Basin area during the past year, has resulted in greatly increased knowledge of the limitations and special problems imposed by permafrost on road and other construction in Alaska.

In addition to studying and advising on specific problems in military geology as requested by the Corps of Engineers, the Survey also has furnished general guidance and instruction to military personnel in the preparation and use of military geologic reports and maps. About 20 officers and enlisted men of the Corps of Engineers were given a 2 weeks' training course in military geology preparatory to assignment to special engineer projects.

Foreign Geologic Investigations

The Geological Survey conducted investigations of mineral resources in Latin America, Asia, and Africa under the auspices of the Foreign Operations Administration, the Atomic Energy Commission, and the Emergency Procurement Service. Assistance in the appraisal of the mineral resources of Mexico, Brazil, Peru, India, and the Philippine Islands was continued. Similar programs were started in Cuba, Chile, Taiwan, Egypt, and Israel. Assistance programs were completed in Colombia, Ecuador, and Saudi Arabia and were nearing completion in Iran and Bolivia. Seminars were conducted in the United Kingdom and India to introduce the newest techniques of geochemical prospecting as a tool for use in the discovery of mineral deposits. A study of the engineering features of the geology of La Paz, Bolivia, is being used by the Government of Bolivia in overcoming construction hazards and in planning the future development of the capital city.

Geologic Maps

The Office of Geologic Cartography, in conjunction with the field units, prepared about 1,453 geologic maps, charts, diagrams, and other illustrations, many of them for multicolor reproduction. Final copy for 31 maps in the geologic quadrangle series, 31 mineral investigations maps, 44 fuels maps, 10 geophysics maps, and the geologic map of Alaska were transmitted to the Map Reproduction Branch. Ninety-seven other multicolor maps are in various stages of preparation.

Library

The Geological Survey Library again exceeded its records in circulation and reader activity. About 24,000 pieces were added to the collection, including 3,000 maps. A total of 48,224 items were loaned to Survey personnel for use outside the library, 4,803 books and maps were sent out on interlibrary loan and 3,553 items were borrowed from other libraries. An estimated 91,590 items were used within the library making a total circulation of more than 148,000. Nearly 27,000 reader visits were made to the library, 2,758 by non-Survey people.

Building up the collections in the branch libraries at Denver and Menlo Park continued with the acquisition of complete sets of important geologic, paleontologic, and general scientific serials as well as current material. Statistics on use are not complete, but the adequacy of the two libraries continues to improve.

The 1951 volume of the Bibliography of North American Geology was in page proof at the end of the year. The 1952–53 volume was completed in manuscript and sent to the editors and the cumulative volume for 1940–49 was in the final phase of preparation.

TOPOGRAPHIC DIVISION

Topographic mapping is an activity designed to furnish accurate and detailed information on the shape, position, and elevation of natural and manmade features of the earth's surface, to civil and military agencies of Government, and to the public. Under this activity, the Topographic Division is engaged in the preparation of an atlas of topographic maps covering the United States, its Territories and possessions, and in maintaining the usefulness of these maps through periodic revision. Certain related activities, such as control surveys, research, preparation of special maps, and supplying map information to the public, are also carried on by this Division.

Since it was established in 1879, the Geological Survey has published about 17,000 topographic maps, now covering about 73 percent of the area of the continental United States. However, many of the older maps, prepared under less stringent requirements, are of limited use today and subject to gradual replacement by modern maps. Others are in need of revision.

Because of better trained personnel and improved instruments and techniques, the Topographic Division showed substantial increase in map production and an appreciable decrease in unit costs in 1955. As a result, an additional 4 percent of the total area of the continental United States was mapped during the year, making a total of 37 percent of its area now covered with good quality maps.

During the year ending June 30, 1955, there were 2,266 maps transmitted to the Publications Office for printing and distribution. Of these maps, 1,280 represented new mapping by the Geological Survey, 121 were Geological Survey revisions of existing maps, 53 were new maps compiled by other agencies and, by interagency agreement, published and distributed by the Geological Survey, 115 were civil editions of maps which had been compiled previously and published for military use by the Department of Defense, 49 were one-color advance editions, 7 were planimetrics, 3 State base maps, 93 State index maps, and 4 were urban area maps. In addition 541 map reprints were transmitted.

The topographic mapping program continued in large degree to be directed toward national defense requirements. The mapping initiated in 1951 to satisfy the immediate and strategic requirements of the Department of Defense was further expanded in accordance with additional priority requests received from that Department. Preliminary plans have been made to accommodate anticipated priority mapping requirements of civil defense. Also, plans have been made for early initiation of mapping in areas pertinent to the implementation of Public Law No. 566, the Watershed Protection and Flood Prevention Act of 1954. Cooperative programs have been continued with many of the States. In addition some mapping has been performed in every State to satisfy civil requirements.

Technical assistance on topographic mapping, which was extended to other nations under the Mutual Security Act of 1951 as amended, was continued in 1955.

The Topographic Division assisted in preparing the mapping portions of the comprehensive resource development reports, prepared by the Arkansas-White-Red (AWRBIAC) and the New England-New York (NENYIAC) Interagency Committees. This work was substantially completed in 1955.

Permanent personnel was decreased this year from 1,896 man-years to 1,780 man-years, or approximately 6 percent. Despite this reduced strength the output of the Division, measured in square miles of completed map compilation and revision, increased about 15 percent.

Mapping Programs and Map Production

Mapping or map revision was carried on during the year in all the 48 States, Alaska, Puerto Rico, the Virgin Islands and the Hawaiian Islands. Federal-State cooperative programs, whereby mapping costs are shared equally between the Federal Government and a State, county, or municipality, were conducted in the 29 States of Arizona, Arkansas, California, Colorado, Connecticut, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New York, North Dakota, Oklahoma (Tulsa County and city), Pennsylvania, Tennessee, Texas (city of Austin), Utah, Vermont, Virginia, Washington and Wisconsin, and in Puerto Rico. The Survey also continued to cooperate with the Tennessee Valley Authority in completing the topographic mapping of that valley.

The end of the year saw the substantial completion of a 5-year cooperative topographic mapping project in Kentucky. This is especially significant in that it represents the largest concentration of mapping operations on a single cooperative project, with the greatest overall accomplishment in the shortest period of time ever achieved by the Survey. This cooperative project resulted in covering the State, more than 40,000 square miles, with a series of 7½-minute maps at a scale of 1:24,000, or 2,000 feet per inch at a uniform scale. Of particular significance is the forward look of the Kentucky officials in immediately starting upon a program for map maintenance in revising those quadrangles in metropolitan areas that have undergone substantial development changes since the mapping was done, and making plans for periodic revision of all the quadrangles in the State.

In addition to the large continuing cooperative mapping program with the State of California, the Colorado River Boundary Commissions of California and Arizona have cooperated with the Geological Survey in the mapping of ten 7½-minute quadrangles along the river between the two States. This mapping was urgently needed in studying changes in the course of the river which originally marked the boundary.

During the year new priority mapping requests were received from the Department of Defense. One major request was for the dual coverage, at 1:25,000 and 1:50,000 scales of an area involving about 16,600 square miles, in Texas. Another major request was for a new 1:250,000 scale map series of all of Alaska, and the early completion of the large scale (1:63,360) compilation as basic data for a large portion of the Territory. The 1:250,000 scale maps when completed will replace the provisional maps that were prepared at this scale a few years ago from existing incomplete source materials.

Mapping in the Territory of Hawaii was continued with the intent of publishing topographic maps of all the islands at the scale of 1:24,000. Operations during the year were conducted on the islands of Oahu, Molokai, Maui, and Hawaii. The mapping of Molokai was completed and the 5 quadrangle maps covering the island are now published. Of the 15 maps required to cover the island of Oahu, 4 have been published and the remaining 11 are nearing completion.

Mapping on the inch-to-the-mile (1:63,360) scale was in some stage of preparation on 471 Alaskan quadrangles covering about 87,000 square miles. Actual accomplishment, in terms of stereocompilation, was about 31,000 square miles. With 104 quadrangle maps published during the year, the total of published maps of this series is now 337.

Two editions of the popular Alaska Map E, scale 1:2,500,000 were published. A newly revised base and a shaded relief edition.

The 1:24,000 scale Virgin Islands mapping program was continued with the maps covering St. Thomas Island essentially completed. Aerial photography has been procured for St. John and St. Croix Islands.

The program of continuous map maintenance or revision in Puerto Rico was continued through cooperative agreement and under the supervision of a Topographic Division resident engineer.

Publication and distribution of a civil edition of the 1:250,000 scale maps of the United States were continued. Publication of the civil edition of these maps, compiled by the Department of Defense for military purposes, will provide topographic maps on the four miles-to-the-inch scale of many areas for which no topographic information of any kind has heretofore been available to the general public. One hundred and forty-two maps of this civilian edition have been published to date, including five covering the Hawaiian Islands.

To establish suitable ties between the detailed mapping operations and the fundamental geodetic surveys of the United States, the Geological Survey executed new third-order control surveys during the fiscal year, to the extent tabulated below:

Spirit leveling, 68,600 square miles.
Transit traverse, 46,900 square miles.
Triangulation, 41,400 square miles.

Permanent marks are established at intervals of 2 or 3 miles along the lines of leveling and traverse, and at most of the occupied triangulation stations.

During the year contracts were let for 183,683 square miles of precision aerial protography for topographic mapping purposes. Of this, 133,386 square miles was the more efficient twin low-oblique photography. In addition, arrangements were made for the Air Force to furnish 58,384 square miles of photographic coverage to the Geologic Survey for use in making topographic maps of a number of Air Force bases. The Air Force also obtained approximately 60,000 square miles of photography in southern Alaska for mapping use by this Division.

One of the largest contracts for aerial photography was for coverage of the Brooks Range area in Alaska. The contract represents a pioneer venture in 1:250,000 scale mapping with transverse low-oblique photography of 121,800 square miles of rugged terrain.

Activities of the Special Maps Branch were in large degree a continuation of the preparation of charts for the USAF Aeronautical Chart and Information Center. In assisting the Air Force program of maintaining worldwide coverage of aeronautical charts, an important contribution is made to the overall Defense program. In addition, many special maps were prepared for other Divisions of the Geological Survey and for other agencies of the Federal Government; these maps included photogrammetric and cartographic map compilation, map revision, preparation of shaded relief, color separation drafting and photographic services. Among the 445 foreign charts completed during the year, 57 were entirely new photocompilation comprising about 160,000 square miles. Twenty-two new photocompiled special maps covered 63,000 square miles in the Arctic region. A large operation concerning radar was completed.

During the year, 110 shaded relief plates on foreign maps were completed. A 2-year program requiring the compilation and color separation drafting of domestic maps at the 1:1,000,000 scale for the United States Army Map Service was approximately 35 percent completed.

New mapping and map revision in the United States (excluding Alaska) for each of the major phases of mapping activity are as follows:

	New mapping (square miles)	Map revision (square miles)	Total (square (square miles)
Photography			125,600
Horizontal control	88,300		88,300
Vertical control	68,600		68,600
Supplemental control	77,800		77,800
Stereocompilation	83,100		83,100
Field compilation	106,300	9,500	115,800
Drafting and scribing			104,000
Transmitted for reproduction			113,200

In addition, relief shading was completed for 16 quadrangles and for Alaska Map E.

The total opposite each operation in the foregoing tabulation represents approximately the annual accomplishments of the Division.

Variations in these totals are due to changes in backlogs and to work done on projects in which only certain operations were concerned. In the fiscal year, work was in progress on 6,784 quadrangles. It usually requires about 3½ years to survey a quadrangle and publish the resulting map.

A detailed summary of map production covering new mapping, remapping, and revision, is shown in the following table:

Areas (in square miles) mapped during fiscal year 1955 for publication on standard scales

[Contour intervals, 5 to 100 feet]

State	Area mapped, scale			New mapping	Revised mapping	Total
	1:24,000	1:31,680	1:62,500			
Alabama	62			62		62
Arizona	638		4, 122	4, 660	100	4, 760
Arkansas	165			165		165
California	4, 398		7, 957	12, 045	310	12, 355
Colorado	3, 068		297	3, 365		3, 365
Connecticut		640		2	638	640
Delaware	560			230	330	560
District of Columbia						
Florida	2, 283			2, 283		2, 283
Georgia	803		535	1, 338		1, 338
Idaho	136		1, 096	1, 232		1, 232
Illinois	56		651	704	3	707
Indiana	487			313	174	487
Iowa			446	446		446
Kansas	1, 554			1, 554		1, 554
Kentucky	5, 033			4, 642	391	5, 033
Louisiana	403		5, 007	4, 397	1, 013	5, 410
Maine			2, 753	2, 753		2, 753
Maryland	159			36	123	159
Massachusetts		477			477	477
Michigan	176		2, 246	2, 422		2, 422
Minnesota	677		1, 766	2, 443		2, 443
Mississippi	36		2, 296	2, 174	158	2, 332
Missouri	350		239	589		589
Montana	1, 226		703	1, 929		1, 929
Nebraska	2, 266			2, 266		2, 266
Nevada	45		379	424		424
New Hampshire	61		16	75	2	77
New Jersey	1, 875			339	1, 536	1, 875
New Mexico	1, 394		357	1, 751		1, 751
New York	3, 110		2, 662	5, 156	616	5, 772
North Carolina			777	777		777
North Dakota	988			988		988
Ohio	2, 365			2, 365		2, 365
Oklahoma	183			183		183
Oregon	895		7, 163	8, 058		8, 058
Pennsylvania	1, 938		1, 433	1, 770	1, 601	3. 371
Rhode Island		479			479	479
South Carolina	220			220		220
South Dakota	2, 300		152	2, 452		2, 452
Tennessee	1, 338			1, 338		1, 338
Texas	2, 685		5, 384	7, 166	903	8, 069
Utah	1, 381		7, 564	8, 888	57	8, 945
Vermont	238		173	392	19	411
Virginia	350		882	1, 096	136	1, 232
Washington	565		1, 716	2, 220	61	2, 281
West Virginia	241				241	241
Wisconsin	529		2, 389	2, 918		2, 918
Wyoming	439		845	1, 284		1, 284
Total	47, 676	1, 596	62. 006	101, 910	9, 368	111, 278
Alaska			[1] 30, 666	30, 666		30, 666
Hawaii	273			273		273
Puerto Rico		[2] 146			146	146
Virgin Islands	33			33		33
Total	47, 982	1, 742	92, 672	132, 882	9, 514	142, 396

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[1] 1 : 63,360.

[2] 1 : 30,000.

Research and Development

A substantial amount of new photogrammetric equipment was put into production work during the year. This includes the ER–55 projector, the Twinplex plotter, aspheric-plate diapositive printers, and variable-ratio pantographs. Each new instrument was developed as part of an overall system for a more efficient way to compile maps photogrammetrically. A United States patent was issued on the Twinplex plotter, dated December 14, 1954, with all rights assigned to the Government.

A significant development during the year was the use of Government-owned T–12 cameras, equipped with near-distortion-free lenses, on certain of our commercial contracts. Photography procured with these instruments is proving to be superior to any heretofore obtained with other aerial cameras.

A new system of checking contractors' cameras before using them on Division projects was instituted during the year. Cameras are now precisely tested on a multicollimator camera calibrator which was designed and built to meet specific Topographic Division needs. Metric characteristics, resolution quality, and mechanical operations are readily evaluated in order to determine if a camera is completely acceptable prior to use.

Design work for a new instrument, the Orthophotoscope, is nearing completion. This is a device for converting conventional perspective photographs to the equivalent of orthographic photographs.

A contract has been placed for twin-camera mounts, the design of which is based on a center-of-gravity principle, to eliminate the effects of airplane vibrations and other motions.

Extensive field tests of our first Survey-developed pendulum alidades continue to show savings in time with improved accuracy. Conversion of our present alidades to the pendulum type is under way.

Multiple base altimetry studies and tests have been made to take into account the slope of the barometric equal pressure surface and to improve instrumental accuracy. The results indicate altimetry is capable of wide application in obtaining elevations for photogrammetric needs in areas of both moderate and high relief.

Integration of negative engraving, or scribing, to replace the drafting process in map-finishing operations, has proceeded so that conversion of all the Division's drafting offices to the negative scribing process is essentially complete.

Continuing progress in writing the Topographic Manual resulted in 27 new chapters, bringing the total published to 69. There are 45 chapters in various stages of preparation and it is estimated that the project is about 75 percent complete.

Work continued on the preparation of contour interval plans for each of the 48 States. Eighteen have now been completed and 13 others are in progress.

Map Information Office

The Map Information Office continues its service to Federal, State, and local Government agencies, and the general public. Requests for maps, geodetic control data, and aerial photographs, continued to increase.

With the current quarterly practice of issuing maps showing the status of mapping in progress, the demand for advance map material has increased over that of previous years.

Heavy demand continues for geodetic control data. Two thousand, one hundred orders were serviced during the year amounting to about 18,900 copies of horizontal and vertical control data assembled in 15-minute quadrangle units.

Aerial photography sales from approximately 2,600 orders resulted in some 121,000 reproductions furnished.

Nearly 13,000 letters were answered by the Office during the year. In addition, 5,160 requests for indexes and status maps were serviced.

WATER RESOURCES DIVISION

The work of the Water Resources Division is to determine and appraise the Nation's surface and underground water resources. During fiscal year 1955 there was a further increase in the public interest in water-resource investigations, due in part to local and regional floods or droughts, in part to increasing competition for existing supplies by municipalities, agriculture, and industry, and in part to a broadened awareness of the importance of having adequate hydrologic data on hand prior to design and construction of such structures as municipal waterworks, reservoirs, dams, and bridges.

Water-resources investigations include the systematic collection, analysis, and publication of hydrologic and related geologic data; appraisal of water resources of specific areas; determination of water requirements for industrial, domestic, and agricultural uses; and research and development to improve the scientific basis of investigations and techniques.

Water-resources investigations are financed from directly appropriated funds, funds transferred from other Federal agencies for work performed directly for them, and from funds provided by States and municipalities for cooperative investigations. From the beginning of Federal-State investigations in 1895, the "partnership" arrangement has grown to include work in all 48 States and in Hawaii and Guam, and to become the largest part of the Division's program each year. Funds made available by States and municipalities in 1955 for cooperative studies were:

State	*Obligation*	*State*	*Obligation*
Alabama	$91,733	New Hampshire	$16,795
Arizona	102,937	New Jersey	72,375
Arkansas	52,782	New Mexico	141,136
California	320,317	New York	206,475
Colorado	72,972	North Carolina	105,961
Connecticut	22,426	North Dakota	42,297
Delaware	36,741	Ohio	140,685
Florida	156,848	Oklahoma	76,754
Georgia	62,633	Oregon	64,901
Idaho	61,513	Pennsylvania	134,320
Illinois	55,761	Rhode Island	20,964
Indiana	113,594	South Carolina	34,257
Iowa	92,979	South Dakota	10,019
Kansas	63,799	Tennessee	82,478
Kentucky	144,625	Texas	268,840
Lousiana	130,570	Utah	112,000
Maine	10,826	Vermont	8,273
Maryland	64,734	Virginia	83,819
Massachusetts	42,093	Washington	131,074
Michigan	78,809	West Virginia	36,450
Minnesota	94,987	Wisconsin	43,486
Mississippi	45,030	Wyoming	55,129
Missouri	28,502	Guam	16,659
Montana	35,794	Hawaii	83,777
Nebraska	73,241		
Nevada	31,624	Total	4,076,797

Surface-Water Investigations

The measurement and publication of basic information on streams, lakes, and reservoirs was continued on a comprehensive scale, with special emphasis given to timely and useful presentation of data collected. These records provide a sound foundation of facts for use in subsequent analysis and study of a wide variety of hydrologic and engineering problems.

Records of surface-water supplies were obtained at more than 6,800 sites in the 48 States and in Alaska, Hawaii, and Guam during fiscal year 1955. Included among the records of surface-water supply are 4,400 records collected in cooperation with 187 agencies of States or their subdivisions and 1,700 records obtained for other Federal agencies such as the Corps of Engineers, Bureau of Reclamation, Tennessee Valley Authority, State Department, Soil Conservation Service, Atomic Energy Commission, and permittees and licensees of the Federal Power Commission.

The compilation of all streamflow records in the United States, for the period 1888–1950, is now 57 percent complete. During the year, completed compilation volumes were published for the New England basins and the Colorado River Basin. These summary streamflow reports will enable water-supply and sanitary engineers, designers and operators of flood-control systems, irrigation projects, and power plants, as well as many others concerned with historical and long-term streamflow data, to have monthly and annual discharge figures and other data in one volume instead of nearly 50 separate reports in the annual water-supply paper series.

Special reports on floods were in progress or near completion for 17 States. Flood-frequency reports for three States prepared by the Geological Survey in cooperation with State agencies, were published during the year. Flood-frequency studies were completed in three other States, and reports are in process of publication. A start was made on a nationwide flood-frequency study that will provide a means for deriving flood frequencies on all streams in the United States.

Hydraulic data on 96 sites where bridges are to be built were furnished to various highway departments during the year, and the number of cooperative agreements with State highway departments was increased to 25. The program of collecting flood-flow data on small streams by means of crest-stage and continuous gages, useful in the design of culverts, is being augmented.

Seventeen interstate compacts for apportionment and division of interstate waters are now in effect and two are under negotiation. These compacts include provisions for measurement of available water, usually by the Geological Survey.

During the year the Chief Hydraulic Engineer of the Geological Survey was appointed by the United States Supreme Court to serve as river master for the Delaware River. As such he administers the terms of the court decree relating to the diversion of water from the Delaware River to supply New York City and to the release of water to improve the low flow of the Delaware River.

Water-resources investigations were made along the Canadian boundary as required by the Boundary Waters Treaty of January 11, 1909, between the United States and Canada, or by orders issued by the International Joint Commission.

Ground-Water Investigations

During 1955 notable progress was made on the more than 500 ground-water projects that are currently under investigation throughout the Nation. These investigations embrace one or more of the following principal types of activity: (1) Describing the occurrence, quantity, and quality of ground-water resources, including delineation of ground-water reservoirs and opportunities for their recharge; (2) describing the occurrence and quality of inland sources of saline waters of interest in any future program of saline-water conversion; (3) studying in detail the hydrology of mining- and oil-field areas, as an aid to both location and economical development of these resources; (4) determining the loss of water through consumption by water-loving nonbeneficial vegetation, as a preliminary to salvaging a part of the water; and (5) describing the nature and extent of salt-water encroachment in coastal areas, as a guide to combating its effects. Most of the projects were a part of cooperative programs with State and municipal agencies in more than 40 States with Hawaii and Guam, and with a number of other Federal agencies, including the Armed Forces, the State Department, the Department of Agriculture, the Atomic Energy Commission, and companion bureaus of the Department of the Interior.

The investigational reports released to the public during the year included descriptions of ground-water occurrence ranging from those found in areas of water scarcity to those in areas of water abundance. Areas of potentially greater use of ground water were described in reports on certain parts of Colorado, Delaware, Maryland, Minnesota, Montana, Nebraska, Nevada, New York, North Dakota, Ohio, Oklahoma, Rhode Island, Texas, Virginia, and Wyoming. Other parts of some of these same States have problems of inadequate water, especially in local areas of heavy pumping.

One of the most significant ground-water studies recently completed concerns that part of the Minidoka project in Idaho known as the North Side pumping division. This is the first major Federal reclamation development in the United States based on ground water. The large perennial supply of ground water contained in the basalt beneath the Snake River Plain will permit irrigation of about 64,000 acres of the project. The reclamation project was authorized by Congress on the basis of a preliminary report by the Bureau of Reclamation. Thereafter, on behalf of that Bureau, the Geological Survey provided additional information on the occurrence and movement of ground water, making the results available in a report released recently.

During the year an important series of areal geologic maps was issued in preliminary form. They were prepared in connection with the Bureau of Indian Affairs, and cover most of the 20,000-square-mile area of the Navajo and Hopi Indian Reservations in Arizona and Utah and a part of that in New Mexico. The series released to date consists of 89 15-minute quadrangles showing roads, settlements, drainage, contacts between geologic formations, the dip of the formations, and the trace of the principal geologic structures. The primary use of the maps will be in the development of water supplies from wells, but supplementary use will be made by geologists, engineers, and prospectors in locating mineral and fuel deposits.

The results of two cooperative studies were published as part of an atlas series. Atlas No. 4, prepared in cooperation with the Conservation and Survey Division of the University of Nebraska, shows the configuration of the water table throughout the State. Used in conjunction with topographic and geologic information, the map will aid in locating water supplies and will be of special help to full development of Nebraska's water resources. Atlas No. 5, prepared in cooperation with the Agricultural and Industrial Development Board of Kentucky, is a map of the Louisville area, Kentucky, showing contours on the bedrock surface. The bedrock surface shown on the map defines the lower limit of the alluvial gravel and sand deposits tapped by most of the wells in the area.

Chemical-Quality Investigations

The object of the Survey's chemical-quality investigations is to determine the quantity, type, source, and distribution of mineral matter in solution in ground and surface waters as a prerequisite to the selection and development of industrial, municipal, and agricultural water supplies. During 1955 much progress was made toward this objective as a result of a wide variety of projects, some nationwide in scope, others related to problems characteristic of regions or local areas.

During the year the chemical quality of about 64,000 samples of water from streams, lakes, springs, and wells, was determined. The major proportion of these water samples was collected at about 450 daily or periodic key sampling sites, mostly on streams, while about 9,000 analyses were of water from wells and springs.

The program included chemical-quality studies of the streams in the Colorado River, Pecos River, and Columbia River Basins, in the New York-New England States, and in Alaska. Also, a network of sampling stations was maintained on western streams to determine trends in mineral content and thus help to insure successful continued operation of irrigation projects. Chemical-quality studies of surface and ground waters were conducted in cooperation with State and municipal agencies in 16 States. Chemical-quality work was also done for the Department of Defense, Atomic Energy Commission, Bureau of Reclamation, Veterans Administration, Federal Housing Authority, and Public Health Service.

Several reports of major importance were released during the 1955 fiscal year. One of these is a reference report consisting of a 2-volume compilation of chemical analyses of water from 1,315 of the larger cities of the United States and is entitled, "Industrial utility of public water supplies in the United States, 1952." The report supersedes a similar report published in 1932. Each volume contains explanatory and interpretive introductory material, including a statistical treatment of the data and map description of hardness of waters in the United States.

In 1955 the first report in a new annual series was published. The series will provide comprehensive continuing information about the chemical quality of surface waters used for irrigation in western United States. The continuous long-term records will assist in the determination of quality of water prior to irrigation development, the extent of water-quality impairment due to drainage return, requirements for maintaining proper salt balance, and the equitable distribution of water.

Publications of special interest included a 4-year progress report on water in the lower Delaware River of New Jersey, Pennsylvania, and Delaware, and reports describing the surface waters of North Carolina, Oklahoma, and Texas, prepared in cooperation with the respective States.

Water temperature measurements are made as a regular part of all chemical-quality investigations. Temperature variations in time and place are of importance to waterworks, industry, fish culture, sediment-transport studies, etc. Daily observations or continuous recordings of temperature were obtained during 1955 at approximately 390 locations. Measurements at many additional locations were made at weekly or monthly intervals.

Sediment Investigations

The investigation of sediment in streams and rivers was continued during 1955, including sampling at 158 sediment stations. Sediment in variable amounts is transported in all natural streams, and the proper design and operation of water development projects must satisfactorily accommodate this sediment.

Comprehensive sediment programs were continued in the Missouri, Rio Grande, and Colorado River Basins. These programs provided measurements and interpretations of sources of sediment, rates of discharge, and other pertinent facts at selected areas and locations to guide the extensive Federal programs of water development in these areas. Assistance to the program of the Soil Conservation Service was provided by projects in small watersheds in the States of North Carolina, West Virginia, Kentucky, Nebraska, Oklahoma, and Texas.

Cooperative programs in sedimentation continued in Iowa, Wisconsin, Kentucky, Ohio, Pennsylvania, and Virginia. Included were intensive investigations of several small watersheds in Pennsylvania and Wisconsin designed to measure and explain changes in the runoff and sediment discharge resulting from the application of conservation practices.

Several reports of investigations were prepared and released to open file. The report, Computation of Total Sediment Discharge, Niobrara River, Near Cody, Nebraska, presents improved and simplified methods for computing the total sediment discharge of streams. Another report, Upland Gully Erosion In the Dry Creek Basin, Nebraska, analyzes sediment sources and erosion processes typical of such areas.

Joint Projects

A few major projects combine two or more types of investigations. Examples of projects of this type on which progress was made in 1955 include studies of water resources in industrial production centers; an inventory of saline water resources; and a survey of the natural radio-activity of surface and underground waters in the United States. In 1953, the Business and Defense Services Administration requested an expanded series of summary reports on the overall water-resources situation for a number of critical centers of industrial production in the Nation. Manuscripts were prepared or reports published on the following industrial areas during the 1955 fiscal year: Wheeling, W. Va.; Steubenville, Ohio; Indianapolis, Ind.; Portland, Oreg.; San Francisco, Calif.; and Mobile, Ala. A report for official use was also submitted within the past year on the water requirements of the pulp and paper industry, a very large water user. A report on rayon and acetate fiber is nearing completion and studies have been started for copper and petroleum products.

During 1955 notable progress was made on the inventory of the occurrence and quality of saline water resources of the United States. A nationwide reconnaissance study was completed, a more extensive study of saline waters in Texas was completed, and a study of saline waters of North Dakota neared completion.

With the increasing amounts of radioactive wastes and potential radioactive contamination of our waters, data on background ("natural") amounts of radioactivity in stream and well waters is necessary in order to measure accurately any increases in contamination when they occur. Research on techniques and interpretation continued in 1955 while a limited program of systematic radiometric sampling of our natural waters was also in progress.

Research and Development

Research and development projects included a study of the factors involved in artificial recharge of ground water; design and development of water-well geophysical exploration units and electrical-analog analyzers; studies of aggradation and degradation in alluvial channels; study of principles of sediment transport; investigation of improved methods and equipment for determining total sediment discharge of streams; basic research in the determination of radioactivity in natural water supplies; a study of the backwater effects of channel constrictions; the hydraulic principles governing the distribution of river flow in multiple-opening river crossings; a study of hydraulic principles governing the flow of water through culverts; studies of new techniques for measuring losses of water from reservoir and land surfaces; and development of means for rapid computation of streamflow records.

Soil and Moisture Conservation

The Geological Survey's program of soil and moisture conservation provided basic data and advice concerning hydrologic and geologic problems for the improvement and maintenance of the productive values of the 280 million acres of Federal land under the stewardship of the Department of the Interior. Special attention was given to comprehensive investigations of water supplies to cover entire grazing or Indian districts so that future "crisis" demands for water in the region could be met efficiently and promptly. Elements of the program were carried on in 1955 on public domain areas of Arizona, Colorado, Montana, New Mexico, Nevada, South Dakota, Utah, and Wyoming.

Technical Assistance Program

The overseas water-resources investigations of the Geological Survey began in 1950 on a continuing basis under the terms of the United States technical assistance program, and during 1955 were conducted under agreements between the Geological Survey and the Foreign Operations Administration. The investigations were initiated by requests from the various countries to the United States overseas missions for technical assistance.

Long-term projects were being carried on in 9 countries by the end of the fiscal year. Of these projects 7 were directed primarily toward ground-water investigations and 2 toward surface-water investigations. Additional short-term ground-water projects were conducted in Thailand and Anglo-Egyptian Sudan and a short-term project on flood-control basic data was conducted in India. The projects generally are designed to combine the training of a nucleus of native personnel in the methods and techniques of water-resources investigations with investigations of specific areas for which development has been proposed. At the end of the year more than 100 nationals were receiving in-country training by Survey personnel on field projects in Afghanistan, Chile, Egypt, India, Iran, Libya, Pakistan, and Peru. One field project in stream-gaging was completed in Jamaica in cooperation with the United Nations and under the auspices of the Technical Assistance Administration. During the year citizens of Canada, Colombia, Cuba, Egypt, and Thailand received training in the United States.

CONSERVATION DIVISION

The Conservation Division classifies Federal lands as to mineral and water resources and supervises mineral-recovery operations under leases, permits, and licenses on Federal, outer Continental Shelf, Indian, and naval petroleum reserve lands. A small headquarters staff and a field staff of competent geologists and engineers are maintained. This force makes field surveys, prepares maps and reports dealing with waterpower, fuels, minerals, and chemicals essential to the mineral-resource economy of the United States, and conducts on-site supervision of mining and drilling operations necessary to assure the safe and economical production by private enterprise of coal, oil, gas, and other minerals.

Mineral Classification Branch

All phases of the service rendered by the Mineral Classification Branch were maintained at a rapid pace throughout the fiscal year 1955. In all, 24,137 cases involving either the outright disposal of Federal lands with no reservation of any mineral, the disposal of such lands with the reservation of one or more specified minerals, or the exercise under the Federal leasing laws of the Government's right to lease for exploration and production, by private enterprise, one or another mineral substance from lands under its jurisdiction, were acted upon during the year. In addition, the Branch prepared and promulgated initial or revised definitions of the known geologic structure of 46 producing oil and gas fields containing Federal lands; appraised geologically 163 unit-plan and participating-area proposals; drafted 12 determinations of leasehold relations to the productive limits of producing oil and gas deposits as found to exist on August 8, 1946; reported for appropriate administrative action the fact and geologic significance of 86 new discoveries of oil or gas made on or affecting

Federal-land leaseholds; recommended the competitive sale of oil and gas leases on 26 parcels of public land; reviewed and reported upon 37 appeals from decisions of the Bureau of Land Management affecting the disposal of Federal lands; and prepared 93 miscellaneous reports on the mineral potentialities of specific lands for various agencies of the Federal Government and inquiring individuals.

From field offices in Colorado, California, Montant, New Mexico, Oklahoma, Utah, and Wyoming, geologists from the Branch made "demand" or specific investigations which resulted in geologic reports and maps for official use. The Branch completed maps and reports on the Belgian Anticline and Mount Poso areas in California; on dam sites on the Cispus River, Wash.; on the Grand Bay oilfield and Houma gasfield in Louisiana; on the Bowes field, Montana; on the Malaga field in New Mexico; on the Tisdale Anticline, Wyoming; on the Yates formation, New Mexico; on dam sites on Byoff and Wagon Creeks and North Fork of Yuba River in California; on the Dry Creek oilfield, Montana; on the Lompoc and Cat Canyon fields, California; on Montana Plains; on the Placerita and Holder Canyon fields, California; Greenwood gasfield, Colorado and Kansas; on Colorado Plains; on Williams Fork Mountain coalfield, Colorado; on the Monument-Jal and San Juan fields, New Mexico; on coal near Weaverville, Calif.; on a portion of the Huntington Beach field, California; on mineral resources, State of Washington; on the Northwest Belgian Anticline, California; on Hamilton Dome field, Wyoming.

Water and Power Branch

The Water and Power Branch conducts investigations to determine potential waterpower possibilities; classifies public lands having value for development of waterpower projects; and works closely with other bureaus and agencies in administration of the public lands so classified. These duties are carried out from a central and regional office in Washington, D. C., and from regional offices in Denver, Colo.; Sacramento, Calif.; Portland, Oreg.; and Tacoma, Wash. Investigatory work in Alaska is directed from Tacoma, Wash. Field work during 1955 was directed mainly toward obtaining basic information on the waterpower resources and storage possibilities of Federal lands in Alaska, California, Colorado, Montana, New Mexico, Oregon, and Washington. Field projects during the year included surveys on Bradley, Chickaloon, Kasilof, and Kenai Rivers, Alaska; Klamath and North Yuba Rivers, Calif.; Arkansas River, Colo.; Flathead and Yaak Rivers, Mont.; Navajo River, New Mex.; Imnaha, Klamath, Nestucca, Trask, and Wilson Rivers, Oreg.; and Callagan and Isabel Lakes, South Fork Skykomish, and Wynoochee Rivers, Wash. In all, 242 channel miles of stream and 13 dam sites were mapped during the year or were under investigation on June 30, 1955. Maps published during the year covered 230 channel miles of stream and 5 dam sites; maps awaiting publication on June 30 include 61 channel miles of stream and 4 dam sites; maps in the office stage of preparation on June 30 include 364 channel miles of stream and 5 dam sites. One report was published as a circular during the year and eight reports were in preparation for publication on June 30. They include an appraisal of waterpower possibilities of streams in Alaska, California, Colorado, Nevada, New Mexico, Oregon, and Washington and a general survey of developed and potential waterpower of the world. Classification activities resulted in the addition of 7,249 acres to power site reserves and elimination of 67,059 acres, reducing the outstanding reserves in 23 States and Alaska to a net total of 7,103,749 acres. Reservoir site reserves were reduced to 135,263 acres by elimination of 629 acres. Supervision was given to 134 power projects under license upon request from the Federal Power Commission and to 827 such projects under permit or grant from the Department of Interior, and to 204 in cooperation with the Bureau of Indian Affairs. Action involving hydraulic determination was taken on 6,338 cases received from departmental sources and the Federal Power Commission.

Mining Branch

The Mining Branch supervises operations concerned with discovery, development, and production of coal, potassium, sodium, phosphate, and oil shale from public domain lands; of sulfur on public lands in Louisiana and New Mexico; of silica sand on certain lands in Nevada withdrawn by Executive Order No. 5105; of gold, silver, and mercury on certain Spanish land grants; of all minerals, except oil and gas, on restricted allotted and tribal Indian lands, on "acquired lands" under the act of August 7, 1947, and provisions of section 402 of the President's Reorganization Plan No. III of 1946, on land in the California State Park under the act of March 3, 1933 (47 Stat. 1487), and on national forest land in Minnesota under the act of June 30, 1950 (64 Stat. 311).

Outstanding mineral leases and permits on "acquired" and Indian lands and lands subject to the aforementioned acts involve the exploration for and production of bauxite, cobalt, copper, gold, iron, lead, manganese, silver, nickel, titanium, tungsten, uranium, vanadium, zinc, asbestos, bentonite, clay, coal, garnet, gravel, gypsum, feldspar, fluorspar, limestone, marble, mica, phosphate, pumice, quartzite, quartz crystal, sand, silica sand, sulphur, and vermiculite.

The Branch is responsible for investigating and reporting on applications for leases and prospecting permits; recommending lease terms, enforcing compliance with lease terms and of regulations governing the conduct of prospecting, mining, and beneficiation, protecting and conserving the natural resources by preventing waste; determining royalty liability; preparing statements and receiving payment of royalties and rentals. The Branch acts in an advisory capacity to the Office of the Secretary, other bureaus of the Department, and other Government agencies.

As of June 30, 1955, there were under supervision 1,813 properties involved in leases, permits, and licenses in 32 States and Alaska, of which 992 were on public lands; 226 on acquired lands; and 595 on Indian lands. Production from such lands under supervision during the fiscal year amounted to 18,845,648 tons, valued at $126,640,569, with royalties amounting to $5,439,344. The production of coal from Federal land in the United States and Alaska aggregated 5,822,237 tons, valued at $31,458,869 with a royalty value of $739,455. Production of coal in Alaska amounted to 689,386 tons. Potash production amounted to 8,602,953 tons of crude and refined salts valued at $58,098,292 and royalty value of $2,453,676 during the fiscal year.

The principal source of sodium was Searles Lake, Calif., accounting for 619,329 tons of the total of 765,939 tons of sodium and associated compounds produced from lands under supervision. Total and royalty values of sodium were $19,322,121 and $616,851, respectively. Phosphate rock and shale production was 1,162,091 tons—548,097 tons from public domain; 3,390 from acquired lands; and 610,604 tons from Indian lands.

Production of lead and zinc concentrates from Indian lands amounted to 35,536 tons valued at $4,037,633 and royalty value of $322,889. Coal and sand and gravel made up the major part of the remainder of the production from Indian lands totaling 1,849,393 tons valued at $1,636,310 and royalty value of $64,387. Coal, fluorspar, zinc, asbestos, bentonite, phosphate, mica, quartzite, feldspar, manganese, quartz crystal, stone, and sand and gravel were produced from acquired lands in 13 States to an aggregate of 295,925 tons valued at $2,081,851 and royalty value of $97,906.

Oil and Gas Leasing Branch

The Oil and Gas Leasing Branch supervises operations for the discovery, development, and production of crude oil, natural gas, and products extracted from natural gas on Federal and Indian lands. These duties were carried out during the year by means of 6 regional offices and 21 district offices at 21 separate locations in California, Colorado, Louisiana, Montana, New Mexico, Oklahoma, Utah, Wyoming, and Washington, D. C. On the public lands 95,890 oil and gas properties were under supervision at the end of the fiscal year, aggregating 71,686,124 acres in 23 States and Alaska.

Drilling on public lands during the year included the spudding of 1,413 wells and the completion of 1,352 wells, of which 937 were productive of oil or gas. In all, 21,758 wells, including 12,433 capable of oil or gas production, were under supervision on June 30, 1955. Production was appreciably greater than in 1954, amounting to about 110,595,718 barrels of petroleum; 260,661,003,000 cubic feet of natural gas; and 211,127,968 gallons of gasoline and butane, with royalty returns to the United States of about $39,222,638.

There were 3,176 acquired land leases, embracing 3,007,824 acres in 29 States under supervision at the close of the fiscal year. Drilling on acquired lands during the year included the spudding of 49 wells and the completion of 49 wells, 21 of which were productive of oil or gas. In all 534 acquired land wells, including 239 capable of oil or gas production, were under supervision on June 30. Including compensatory royalty allocated to the Rio Vista gasfield the production from acquired land was about 2,862,960 barrels of petroleum; 7,432,954,000 cubic feet of natural gas; and 57,410 gallons of gasoline and butane, with royalty returns of about $1,268,203.

The Branch supervised operations on 10,900 leaseholds, embracing 3,117,176 acres on Indian lands in 16 States, which contained at the end of the year a total of 8,353 wells, 4,657 of which were productive of oil or gas, and 488 of which had been completed in the year. The total revenue from royalties, rentals, and bonuses amounted to $19,044,522. Of this amount, $5,958,121 accrued as production royalties.

Outstanding on June 30, were 12 protective leases issued to protect from drainage Federal lands subject to leasing (national monuments, military reservations, etc.). A total of 45 productive wells on these leases returned royalty for the year in excess of $829,294. On behalf of the Department of the Navy, supervision was continued over the production of oil, gas, gasoline, and butane from 17 properties under lease in Naval Petroleum Reserve No. 2 in California. Production from 299 active wells in this reserve totaled 2,206,989 barrels of petroleum; 1,689,539,000 cubic feet of natural gas; and 9,627,897 gallons of natural gasoline and butane, with an aggregate royalty of $959,177.

Activities toward unitization of oil and gas operations involving Federal land were reflected in the approval of 72 new unit plans during the year and the termination of 70 previously approved unit plans, leaving 303 approved plans, covering 5,333,097 acres, outstanding. About 50 percent of the petroleum, 26 percent of the natural gas, and 61 percent of the gasoline and butane obtained from public lands during the year was produced under approved unit agreements. One Indian land unit agreement was terminated during the year and one was contracted, leaving a total of 11 such approved plans, covering 58,580 acres, outstanding on June 30. Also, 96 drilling unit, or communitization, agreements were approved during the year, making a total of 482 approved as of June 30.

Work on Publications

The primary purpose of the Geological Survey is to provide for the people and the agencies of government information necessary for the exploration, development, and conservation of our mineral and water resources. As this information becomes available through investigations, surveys, and research, the fulfillment of this purpose is served by the publication of a variety of reports, maps, and charts. The information is published in part by the Survey and, in part, by cooperating States, and by many scientific journals. These publications include maps of the topographic and geologic features of the Nation, studies of mining districts and mineral deposits, of the composition and structure of rocks and minerals, of fossils and the rocks in which they are found, of geophysics and geochemistry, and studies of streamflow and ground waters and their chemical quality.

Section of Texts

Editing and otherwise preparing Survey-produced manuscripts for publication is the function of the Section of Texts. It performs practically all liaison duties necessary to the printing of Survey professional papers, bulletins, water-supply papers, and circulars.

During fiscal year 1955, 234 new manuscripts were received by the Section, 205 were sent to the printer and 237 reports were published. Work on new manuscripts prepared in fiscal 1955 included editing of 21,941 pages; checking of 3,647 galley proofs and 12,506 page proofs; preparing 26,192 index entries and readying 94 pages of miscellaneous material for mimeographing.

Printed reports delivered included 46 professional papers, 47 bulletins, 60 water-supply papers, 35 circulars, and 30 chapters for the new edition of the Topographic Manual. These publications covered a wide range of subject material: General geology of particular areas; mining districts and local mineral deposits in the United States, Alaska, Hawaii, Mexico, and the Marshall Islands; studies of fossils; a collection of papers on geochemical research; geophysical abstracts, measurements of streamflow and of water levels and artesian pressures in wells; general studies of underground water and of the occurrence of floods with consideration of the influence of geology and physiography.

Lists published monthly provided information on new publications of the Survey. Also printed during the year was the First Supplement to Publications of the Geological Survey. Copy for the Second Supplement was prepared and sent to the printer.

Section of Illustrations

This Section prepares illustrated matter used in publications of the Geological Survey.

At the beginning of the fiscal year, 61 reports were on hand, 55 of which were in various stages of completion; 139 new reports were received during the year, making a total of 200 reports. Of this total, 92 were completed and transmitted for publication, as compared to 85 in fiscal year 1954. At the end of the year, 108 reports were on hand, 66 of which were in various stages of completion.

The reports transmitted included 42 bulletins, 21 professional papers, 26 water-supply papers, and 3 hydrologic atlasses; 1,935 drawings and photographs were prepared for these reports. A total of 246 maps, sketches, and diagrams were also prepared for 28 circulars.

During the year, 115 miscellaneous drawings and preliminary work on 96 geologic quadrangles of the Navajo Indian Reservation were completed for the Water Resources Division.

A total of 2,392 drawings and photographs were completed by the Section, of which 225 were for multicolor reproduction.

Map Reproduction and Distribution

The warehousing and distribution of Geological Survey maps are handled primarily by the Washington, Denver and Alaska sections of the Distribution Branch. Local distribution is also carried on by 12 other Survey field offices and more than 400 commercial agents who purchase maps for resale to the general public.

In addition to approximately 25 million maps and book reports on hand at the beginning of the year, the branch received 7,300,000 copies of 2,669 new and reprinted maps from the Map Reproduction Branch and 224,750 copies of 321 separate books and pamphlets printed by the Government Printing Office and the Interior Duplicating Section.

Approximately 3,210,000 maps and indexes were distributed during the year and about 290,000 volumes were involved in the limited distribution of book reports. This distribution activity represented an increase of 34 percent over the previous year and was accomplished at a slightly reduced cost. This record breaking distribution has resulted from the processing of more than 200,000 individual requests and resulted in receipt of $370,000 from the sale of maps, $24,000 of which was received from other Federal agencies.

The total number of copies of maps and book reports distributed by the Geological Survey offices as compared with fiscal year 1954 is shown in the following table:

	Fiscal year 1954 maps, reports, and indexes	Fiscal year 1955 maps, reports, and indexes	Percentage of increase
Washington	1,720,000	2,291,400	33
Denver	754,800	991,600	31
Alaska	43,800	56,900	30
Other field offices	93,400	157,700	69
Total	2,612,000	3,497,600	34

The production of the Map Reproduction Branch increased more than 25 percent over the past fiscal year. The following is a summary of the production:

	New	Reprinted
Topographic Division maps:		
Standard topographic	[1] 1,689	159
Standard topographic (Engineers)		238
1:250,000 scale [2]	27	
Scale conversion	16	
Planimetric	71	4
State base	9	5
State topographic indexes	87	
Status index	4	
Miscellaneous	6	129
Geologic Division:		
Geologic quadrangle	22	
Mineral investigation	23	2
Geologic indexes	4	
Coal	15	1
Oil and gas maps	22	9
Oil and gas charts		2
State geologic	3	
Geophysical investigation	13	
Geologic status	2	3
Miscellaneous	62	1
Conservation Division: River survey	22	
Water Resources Division: Miscellaneous	18	1
Total	2,115	554

[1] Includes 19 printed by other Government agencies.
[2] Printed by other Government agencies.

These 2,669 new and reprinted map editions comprise 7,850,454 copies and 38,013,262 impressions, of which 7,701,864 copies and 37,160,272 impressions were printed in the Survey's plant. These maps range in size from 17 by 21 inches to 50 by 72 inches. Among the more difficult maps reproduced were the geologic State maps of Oklahoma, Wyoming, and New Hampshire.

In addition to the foregoing production, 917 jobs comprising miscellaneous maps and other preliminary map services were completed. This printing amounted to 775,817 copies and 3,085,335 impressions, including 167 illustrations comprising 484,840 copies and 1,992,864 impressions for the Government Printing Office. The rest of the miscellaneous printing and service was done for 33 units of the Government, including branches of the Survey and various States. Also, 2,353 type jobs (impressions on cellophane for map preparation) were delivered, and 975 maps were mounted on cloth.

The total cost of all production was $1,493,157. Of this amount $24,082 was received from other agencies for copies of maps, and $19,443 was paid by other agencies for printing or service work. The remainder of the cost $1,449,632 was charged directly or indirectly to Survey funds.

A summary of the work accomplished within the Survey's plant is as follows:

1. A total of 8,477,681 map copies (40,245,607 impressions) was reproduced and delivered;
2. The Photographic Process Section prepared 12,285 photolithographic printing plates, and the Hand Transfer Section prepared 1,063 printing plates;
3. The Photographic Laboratory made 11,264 photolithographic negatives, 4,106 photographic negatives ranging from 2 by 2½ inches to 30 by 40 inches, 12,195 prints ranging from 1½ by 2 inches to 40 by 72 inches, developed 65 film packs and 33 rolls of film, made 637 lantern slides, developed and printed 58,550 feet of 35-mm. aerial film, and mounted 361 prints.

Public Inquiries Offices

Establishment since June 1950 of five Public Inquiries Offices in Denver, Colo.; Salt Lake City, Utah; San Francisco and Los Angeles, Calif.; and Anchorage, Alaska, has resulted in a substantial improvement in the availability of the results of Survey investigations to the public. These offices carry stocks of Survey maps and reports concerning their respective areas, answer all types of inquiries, and direct specific questions on technical matters to appropriate Division technical officers. Maps and reports are sold "over the counter"; but the offices are not equipped to handle mail orders.

FUNDS

During the fiscal year 1955, obligations were incurred under the direction of the Geological Survey totaling $46,858,959. Of this amount 56 percent was appropriated directly to the Geological Survey, 32 percent was made available by other Federal agencies, and 12 percent by States and their political subdivisions.

Obligations incurred by the Geological Survey in fiscal year 1955, by source of funds

Topographic surveys and mapping:		
Geological Survey appropriation		$11, 498, 991
Reimbursements from non-Federal sources:		
States, counties, and municipalities	$1, 217, 547	
Sale to the public of aerial photographs and photographic copies of records	79, 480	
Sale of personal property	27, 339	
		1, 324, 366
Reimbursements from other Federal agencies:		
Bureau of Reclamation	901, 941	
Department of the Air Force	979, 088	
Department of the Army	1, 045, 115	
Department of the Navy	25, 877	
Atomic Energy Commission	159, 236	
Miscellaneous	69, 095	
		3, 180, 352
Total appropriation and reimbursements		16, 033, 710
Direct State payments		15, 552
Total, topographic surveys and mapping		16, 019, 261
Geologic and mineral resource surveys and mapping:		
Geological Survey appropriation		5, 346, 472
Reimbursements from non-Federal sources:		
States, counties, and municipalities	$169, 674	
Sale of personal property	13, 255	
		182, 929
Reimbursements from other Federal agencies:		
Bureau of Mines	40, 000	
Bureau of Reclamation	101, 270	
Defense Minerals Exploration Administration	416, 939	
Department of the Air Force	33, 601	
Department to the Army	1, 097, 607	
Department of the Navy	365, 287	
Atomic Energy Commission	5, 817, 458	
Foreign Operations Administration	527, 946	
General Services Administration	268, 935	
Government Printing Office—map reproduction	92, 646	
Miscellaneous	50, 542	
		8, 812, 231
Total, geologic and mineral resource surveys and mapping		14, 341, 632

Obligations incurred by the Geological Survey in fiscal year 1955, by source of funds—Continued

Water resources investigations:		
Geological Survey appropriation		$6,658,580
Reimbursements from non-Federal sources:		
States, counties, and municipalities	$3,032,543	
Permittees and licensees of the Federal Power Commission	103,555	
Sale of personal property	26,610	
		3,162,708
Reimbursements from other Federal agencies:		
Bureau of Indian Affairs	162,223	
Bureau of Reclamation	722,694	
Office of the Secretary	13,731	
Department of the Air Force	71,434	
Department of the Army	1,049,207	
Department of the Navy	37,609	
Department of Agriculture	134,932	
Department of State	119,749	
Atomic Energy Commission	278,314	
Foreign Operations Administration	311,847	
Tennessee Valley Authority	93,756	
Miscellaneous	40,145	
		3,035,641
Total appropriation and reimbursements		12,856,929
Direct State payments		1,044,255
Total, water resources investigations		13,901,184
Soil and moisture conservation: Geological Survey appropriation		100,751
Classification of lands:		
Geological Survey appropriation		411,269
Reimbursements from non-Federal sources: Sale of personal property		586
Reimbursement from other Federal agencies: Miscellaneous		2,609
Total, classification of lands		414,464
Supervision of mining and oil and gas leases:		
Geological Survey appropriation		1,291,438
Reimbursements from non-Federal sources:		
Sale to the public of aerial photographs and photographic copies of records	$92	
Sale of personal property	1,711	
		1,803
Reimbursements from other Federal agencies: Department of the Navy		38,236
Total, supervision of mining and oil and gas leases		1,331,477
General Administration: Geological Survey appropriation[1]		750,190

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[1] In addition, funds advanced or reimbursed by other Federal agencies for program expenses bear an equitable share of general administrative expenses. Such charges in 1955 were $523,894.

Obligations incurred by the Geological Survey in fiscal year 1955, by source of funds—Continued

Summary:		
Geological Survey appropriation		$26,057,691
Reimbursements from non-Federal sources:		
States, counties and municipalities	$4,419,764	
Miscellaneous	252,628	
		4,672,392
Reimbursements from other Federal agencies		15,069,069
Total appropriation and reimbursements		45,799,152
Direct State payments		1,059,807
Grand total		46,858,959

BUREAU OF MINES

John J. Forbes, *Director*

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FOREWORD

RECORD production of helium, progress in developing new techniques for secondary recovery of petroleum, improvements of methods for reclaiming essential metals from scrap, and advancement of fundamental knowledge of explosions were among major accomplishments of the Bureau of Mines during fiscal 1955.

These achievements, and others, were added to a list that began with the Bureau's creation in 1910. Through the years, Bureau researchers, engineers, and technologists have worked closely with those in other organizations to promote fuller and wiser use of our mineral resources and to make safer the jobs of those who extract and process them.

After Bureau metallurgists helped erase shortages of titanium and zirconium during the year, Government plants closed, and commercial firms took over the entire responsibility for producing these vital metals in volume. Bureau fuels technologists found ways to increase recovery and achieve more efficient use of our reserves of coal and petroleum and strengthened the foundation for a great new private industry of the future based on mountains of oil shale that long have lain idle in the West.

The Bureau's work in the field of health and safety earned the respect and wholehearted cooperation of all segments of the mineral industries. Regular inspections of coal mines, coupled with safety training developed in years of intensive research and investigation, contributed immeasurably toward keeping coal-mine accident and fatality rates low as the industry began a steady climb toward normal.

In the realm of economics the Bureau performed outstanding service, both for industry and for the general public. Results of detailed economic and statistical studies on hundreds of mineral commodities, foreign and domestic, were made available regularly to American businessmen and others interested in the mineral-supply picture. Those who plan for the Nation's military and economic security were kept constantly informed through Bureau reports on the availability of strategic minerals and the economic condition of the industries that supply them. While students from friendly foreign countries received technical training at various Bureau laboratories, the Bureau's own corps of foreign-minerals experts served in faraway lands, giving advice and assistance in the development of new sources of mineral supply.

The fiscal year 1955 saw increased need for the Bureau's services. This need was met despite the exigencies of a Bureau reorganization, carried out in general along the lines suggested by a survey team appointed by the Secretary of the Interior. The reorganization, completed by January 1955 with minimum disturbance of normal operations, permits the helium and health and safety activities to function as separate units and will promote greater overall efficiency throughout the Bureau.

Activities and accomplishments of the Bureau during the year are described in the sections that follow.

MINERAL DEVELOPMENT

The long-term upward trend in mineral consumption in the United States due to population growth, technological developments, and higher living standards was renewed during the fiscal year 1955, as the year saw a reversal of the decline that marked 1953 and early 1954. Despite a relaxation in worldwide tensions, demands for minerals for military production and stockpiling continued strong.

As a result of these and other developments new emphasis was placed on Bureau of Mines work. The Report of the President's Cabinet Committee on Minerals Policy of November 30, 1954, recommended actions to encourage vigorous development of domestic mineral resources and placed certain responsibilities upon the Department of the Interior.

A major function delegated to the Bureau of Mines was joint participation with the Geological Survey in selecting and administering exploration projects undertaken by industry under the Defense Minerals Exploration Administration program. Commodity specialists of the Bureau and the Survey worked with commodity divisions of DMEA in evaluating projects designed to develop new reserves of strategic and critical materials. On-site investigations are made for DMEA by Bureau-Survey field teams whose function is to recommend approval or rejection of applications referred to them. The field teams likewise supervised and administered DMEA contracts and reported on the final results.

On September 25, 1954, a new building housing the Rare and Precious Metals Experiment Station was dedicated at Reno, Nev., replacing facilities that had become inadequate. Principal research at Reno will focus on the group of new metals whose potentials are just being discovered, but studies on the traditional nonferrous metals will continue.

Consolidations resulting from the Bureau's reorganization resulted in closing stations at Raleigh, N. C., and Mount Weather, Va. In addition, many activities were transferred from College Park, Md., to Reno, Nev., and other stations, and field programing was planned to concentrate research of a particular type at a single laboratory.

During the year an agreement was signed providing joint preparation by the Bureau and the Geological Survey of technological and economic reports requested by the newly formed Office of Minerals Mobilization. Nine reports were completed.

An agreement also was signed between the Department of the Interior and the Office of Defense Mobilization which gave the Department responsibility for preparing and periodically revising material surveys with respect to 45 mineral raw materials. Twelve such reports have been issued, 11 by Mines and Survey; 9 others were being readied.

The Bureau was represented on many technical, industrial, and Government committees and boards, including those of the American Society for Testing Materials, American Institute of Mining and Metallurgical Engineers, and National Academy of Sciences.

Base metals.—Aimed at conserving mineral resources through improved mining methods, three long-range research programs were in progress in cooperation with industry at large copper mines in Michigan, Arizona, and Nevada. These studies will result in better understanding of the structural behavior of rocks and contribute substantially to improving the extraction of ore. Studies of mining methods and costs, important phases of the Bureau's program before World War II, also were resumed to provide up-to-date information to industry.

To increase the reserve base for lead and zinc Bureau experts conducted research on ore discovery, beneficiation of minerals, secondary recovery, and improved zinc-base alloys. Studies of geophysical exploration methods continued in the Racine-Spurgeon area of the Tri-State district, beneficiation methods for oxidized lead ores of Southeast Missouri were investigated, and advance was noted in development of a chemical method to recover zinc through caustic leaching of oxidized ore from Goodsprings, Nev.

As part of a program to increase the recovery of nonferrous metals from scrap or residue, vacuum distillation was employed to obtain high-purity zinc from galvanizers' dross. Progress also was made in improving methods for recovering metals from scrap by using electrolysis, mechanical separation, and selective oxidation.

Development of better zinc-base die-casting alloys received further attention. Alloys containing about 0.6 percent lithium, 3 percent copper, and 7 percent aluminum were found to have outstanding properties. This series is being investigated further along with the influence of other elements alloyed with high-purity zinc.

Encouraging developments in salvaging tin from slimes resulted from the Bureau's study of recovering ultrafine mineral particles. Research continued to reduce metal losses at the Government-operated tin smelter in Texas, and methods for recovering tin from accumulated slag also were investigated,

Laboratory techniques developed to recover a bulk sublimate of cadmium, germanium, and other metals from zinc concentrates may lead to economic ways for increasing the recovery of these metals at zinc plants. Although cadmium was in plentiful supply, a growing demand for the metal is anticipated.

A compilation of information on domestic occurrences and resources of mercury was under way to facilitate expanded production in an emergency. Widespread occurrence of mercury-antimony ores in Alaska leads to the belief that large reserves may be found, and the Bureau continued its research on extraction methods aimed at utilizing the material.

Ferrous metals and alloys.—The Bureau program for iron and steel was directed toward long-term planning for increased domestic iron-ore output and improved production technology. Successful beneficiation tests were made on low-grade iron ores from the Pacific Northwest, the Southeast, and Texas. Over 100 bulk samples of Lake Superior taconite were taken, analyzed, and classified by metallurgical type. This was part of a comprehensive study to determine the extent and grade of deposits and develop metallurgical methods. The Bureau's blast furnace was enlarged and redesigned so that test results would closely approximate those attained in commercial practice. Use of anthracite as a partial substitute for coke in iron and steel production was undertaken, with encouraging results.

Further advances were made in the lance-injection method for removing or adding certain elements in steel manufacture. Other programs seeking to improve steelmaking techniques and steel quality included a study of the effects of rare-earth elements upon the mechanical properties of carbon and low-alloy steels, basic research in high-temperature reactions with slags and gases, and the use of east Texas ores in a two-step electric-furnace operation. To reduce the melting time in steelmaking furnaces, a portable, top-fired furnace for preheating scrap before charging was investigated, with promising results.

Efforts to reduce the Nation's dependence on foreign supplies of manganese were based on continued investigation of domestic raw-material resources and metallurgical research to develop effective recovery methods for subgrade and refractory manganiferous materials. Standard ferromanganese was produced from Artillery Peak, Ariz., ore by concentration, sintering, and electric furnace smelting. A new acid-leach process for beneficiating manganese ores also was examined. In another area of research a manganese-copper alloy with exceptional vibration-damping capacity was developed. This will have valuable applications by the Bureau of Ships and in industry.

Experimental roasting and leaching methods for upgrading chromite ore were developed to enable production of metallurgical-grade chrome from low-grade Montana deposits, the principal domestic source of this strategic mineral. Continued testing to develop more ductile high-purity chromium determined that very small quantities of nitrogen lowered the ductility. Refractory mortars that met Federal specifications for Grade A superduty mortars were prepared from domestic chromite and magnesia.

As a result of a drilling program that had established large reserves of nickel ore in the vicinity of Nicaro, Cuba, work was begun in October 1954 on a 75-percent expansion of the capacity of the nearby Government-owned processing plant. Metallurgical research by the Bureau was continued to devise improved beneficiation methods for the ore and investigate methods for recovering the iron, chromium, and cobalt contents. Near the end of the year the Bureau made a 2-year agreement with GSA that will permit acceleration of the metallurgical research program on the Cuban ore.

Light metals.—Assistance was given industry through tests made to beneficiate alumina and bauxite. Bureau researchers found it possible to decrease the iron content of the alumina specimens while the bauxite was successfully upgraded into a material suitable for manufacture of alum. Laboratory tests demonstrated that the alumina content of Bayer-process residues and high-silica bauxites could be recovered by a lime-soda sintering process.

Research also progressed in the reduction of low-grade aluminous materials by electrothermal smelting methods. Refining of the crude product, by partly cooling the molten alloy and then filtering, yielded aluminum and silicon master alloys suitable for the aluminum industry.

Research completed during the year resulted in development of a wider range of magnesium-lithium-aluminum alloys, with improved physical properties. Basic information provided by the Bureau contributed greatly to the development of techniques for utilizing these lightest and most ductile of the magnesium alloys in fabricated parts for aircraft and missiles.

The Bureau halted titanium production at its pilot plant at Boulder City, Nev., in September. Under a contract with the GSA's Emergency Procurement Service, 246 tons of acceptable titanium sponge for national defense had been produced from July 1953 until the plant closed. The project also provided information that enabled the Bureau to make a more accurate economic and technical evaluation of the thermic process for producing titanium sponge. This method involves reduction of titanium tetrachloride by magnesium.

Near the year end a cooperative agreement was signed with the Wah Chang Corp. under which the Bureau will conduct research on an improved process for producing titanium sponge. Part of the Boulder City pilot plant was reactivated to carry out the project.

Bureau studies on extractive and physical metallurgy of titanium advanced during the year. An electropurification process for titanium metal appears adaptable to commercial production of high-purity titanium, and valuable facts were obtained from research in reducing titanium chloride by sodium. Reports for the technical world were published on electrodeposition of titanium metal, chemical and galvanic corrosion of titanium, welding of titanium, and fabrication and utilization of titanium metal and its alloys.

Aiding the GSA, the Bureau examined and analyzed titanium metal offered for sale to the Government by private producers. Bureau representatives also were engineering consultants to the GSA on Government titanium production and research contracts let to industry.

Rare and precious metals.—The Bureau's search for deposits of uranium and thorium ores for the Atomic Energy Commission resulted in the discovery of several potentially important sources of fissionable elements in Idaho, Georgia, Montana, South Carolina, and Washington. Commercial development was begun in Idaho and South Carolina to recover strategic minerals from placer deposits first pointed out by Bureau investigations. Under a contract with the AEC, Bureau technologists analyzed and evaluated over 25,000 mineral samples submitted by the public and believed to contain fissionable elements. This compares with some 11,000 samples tested the previous year.

During the first half of the year the Bureau's Northwest Electrodevelopment Laboratory at Albany, Oreg., again was the principal supplier of the zirconium and hafnium required by the AEC. However, production by industry, which had adopted the Bureau-developed process, increased to the point where the Albany output no longer was needed, and so the plant was closed.

An agreement between the Bureau and the AEC established a new research program centering on development of thorium. In cooperation with the GSA, a successful pilot-plant demonstration was made of a process for extracting columbium and tantalum from tin slags and domestic ores.

Recognizing the growing industrial need for selenium, the Bureau and the GSA cooperated in an accelerated program to develop sources of this critical material. A drilling program was begun on seleniferous tuffs near Lysite, Wyo., to determine the grade and extent of the ore. At the same time, research was started for recovering selenium from these low-grade deposits.

An intensive research program was begun at the new Reno, Nev., station to devise extraction and separation methods and to determine the physical properties and applications of the so-called rare-earth metals and their compounds. The Bureau anticipates important industrial uses for many of these materials, which only recently have been available in appreciable amounts through ore discoveries and as byproducts of thorium production.

Ceramic and fertilizer materials.—The Bureau's experimental "planer," a mechanical mining machine, was used successfully in one section of a Montana phosphate-rock mine. This area had been abandoned as unsafe for conventional mining methods. The extraction rate in one test approached 1 ton per minute. Changes in design were made on the basis of performance data. With the cooperation of industry, further tests in other mine areas are planned to provide additional data on continuous mining under varying conditions. Meanwhile, research continued on beneficiation techniques intended to permit utilization of larger quantities of low-grade western phosphate rock. Preliminary studies also were made of methods to utilize phosphatic slime from the Florida and Tennessee phosphate-rock-washing operations.

Samples of low-melting synthetic micas were prepared for industrial evaluation as bonding agents for grinding wheels. Several mica-nickel cermets were prepared, using normal fluorphlogopite mica, boron micas, and nickel-containing micas. Other research was undertaken for methods of growing large crystals of synthetic mica and of improving the strength and flexibility of reconstituted mica sheet. New techniques for growing large crystals by differential cooling from a shallow melt and by slow withdrawal of a seed crystal from a mica melt were not immediately successful. The most promising development in forming reconstituted synthetic mica sheet was utilization of a fugitive mineralizer during hot-pressing. Reports on several phases of synthetic mica research were published.

Plans for the coming year include further tests on the production of large mica crystals by the slow withdrawal method; investigation of a new technique of internal resistance melting to improve furnace operations, decrease power costs, and possibly increase crystal size; and a study of the basic factors involved in preparing reconstituted sheet from synthetic mica flake. Long-range plans include investigation of the properties of other types of potentially useful synthetic mica compounds and systematic measurement and cataloging of information on the physical properties of synthetic fluorine micas.

Research advanced on the preparation and properties of artificial abrasives, such as carbides, silicides, borides, and nitrides, to determine their suitability as substitutes for industrial diamonds. A survey of the world supply of crude abrasive materials and manufactured abrasive products was begun.

Reports of the ceramic resources of the Pacific Northwest and refractories consumption in California and Nevada were prepared for publication. Reconnaissance investigations of refractory clay resources in Colorado were substantially completed, and similar investigations were planned in Utah and other Rocky Mountain States.

Pilot-plant studies of the recovery of kyanite and sillimanite from the tailings of a Florida ilmenite-monazite operation were completed. It was found that a mixed concentrate of the 2 minerals having less than 5 percent total impurities can be obtained. Successful application of the process would provide several thousand tons of concentrate per year, since the tailings contain up to 20 percent combined kyanite and sillimanite.

Construction and chemical materials.—Rapidly changing market conditions in the fluorspar industry and a decline in domestic output of fluorspar caused the Bureau to launch a detailed study of this strategic material. Special reports were prepared for Federal defense agencies responsible for stockpiling and other programs affecting this commodity. Deposits of fluorspar were examined, and methods of beneficiating fluorspar ores were being developed. Laboratory work continued on the problem of recovering fluorine from waste gases created during the processing of phosphate rock.

Several reports reviewing accomplishments of the Bureau in the synthesis of asbestiform fibers were being prepared, and one was nearly completed. Studies still were under way in this field and also on beneficiation processes for natural asbestos. A detailed report on the asbestos industry was prepared for publication. In the field, drilling in Maine revealed some asbestos, but more exploration is required to evaluate its potential. In Venezuela a Bureau engineer examined an asbestos mine that was being considered as a possible source of strategic grade asbestos for the National Stockpile.

Experience during the past several years has demonstrated the need for more detailed information on sulfur resources of the United States. Consequently, the Bureau compiled data on this commodity and began preparing several circulars which will be issued when studies are completed.

Because ample supplies of cement and aggregates are essential to continued growth of the construction industry, basic facts compiled by the Bureau on these commodities were widely used by organizations concerned with major construction programs and policy. A special survey necessary in developing a national road-construction program was made of future cement-production capacity. Since there is an urgent need for work on mineral-aggregates problems the Bureau plans to increase its research in this field.

Miscellaneous research on minerals.—Bureau research regarding the fundamental properties of materials has led to outstanding publications on physical properties of rocks and compounds. The basic data developed played an important part in the preparation in 1954 of a manual for the Army Corps of Engineers entitled "Design of Underground Installations in Rock." The manual was nearly completed at the end of the year.

Instruments were developed for studying large-scale caving methods of mining, and field application will progress during the coming year in cooperation with industry. Developments by the Bureau included a camera and caliper for inspecting boreholes as small as 3-inch diameter to depths up to 2,000 feet.

Fundamental testing of blasting methods continued. One phase involved the use of high-speed motion-picture cameras to photograph blasting scenes at taconite and limestone operations.

The year's work on fundamental ore dressing included tests on flotation, electrostatic separation, and ultrasonic energy. Also investigated were methods for producing synthetic minerals and compounds that may replace scarce minerals. Like most of the miscellaneous research the results of this work will be reflected in commodity research and development during coming years.

Studies of mining methods and costs in cooperation with industry were accelerated, and a manuscript on western uranium-mining methods was completed.

PETROLEUM AND NATURAL GAS

Petroleum and natural-gas production.—The important study of the effects of different drilling fluids on the permeability to oil of reservoir rocks immediately surrounding a well bore neared completion and will reveal the degree of contamination by different liquids commonly used in completing petroleum and natural-gas wells. Substantial progress continued on clay studies, and the Bureau plans to broaden the scope of identification by X-ray diffraction not only to clay minerals but other minerals that are important in studies of reservoir rocks. Studies of Wyoming oil and gas fields for the Missouri Basin Field Committee of the department will be continued at the Laramie, Wyo., station, but the Arkansas-White-Red River Basin studies conducted at the Bartlesville station terminated at the end of the year. Volume 1 of a three-volume monograph, Phase Relations of Gas-Condensate Fluids, will be published by the end of 1955 in cooperation with the American Gas Association.

Twenty-three reports and papers on scientific and engineering research concerning primary and secondary petroleum-recovery operations and River Basin cooperative studies were completed. Similar scientific and technical reports will be continued in selected areas and fields in Texas, Oklahoma, Kansas, Louisiana, Arkansas, California, Wyoming, Pennsylvania, and West Virginia.

Laboratory experiments to evaluate the most adaptable radioactive substance for a water tracer indicate that iridium 192 probably will be usable without undue absorption in an underground reservoir. Other important laboratory research evaluated the effectiveness of more than 200 detergents in petroleum-sand systems by the centrifugal method and revealed that several well-balanced nonionic detergents are effective for oil displacement; other results seemingly indicate that the detergent solution enters into a sand formation previously impermeable to water.

Studies of porphyrins in Colorado oil shale and water-spray extracts of a California crude oil were completed, and reports were prepared. A study of deasphalting crude oil by propane precipitation is nearly completed, and similar progressive laboratory work will be continued. Considerable laboratory work was done to evaluate the fundamental properties of Appalachian oil-reservoir rock, and the project will continue.

Another cooperative study with the American Gas Association on the deliverability of natural gas from underground storage reservoirs resulted in five tests in fields in Oklahoma, Kansas, West Virginia, and Pennsylvania. Preliminary results reveal that a gas-storage reservoir of high and uniform permeability and relatively free of water will receive and deliver gas in an identical manner. A significant study of the flow of natural gas through experimental pipelines and transmission lines was completed and will be published as a monograph by the American Gas Association.

The new Division of Petroleum came into being January 2, 1955, and several organizational and planning conferences were held. A steering committee was formed to review and reorganize the Bureau's production-research program on a national and unified basis and eliminate possible duplication. The Appalachian Experiment Station, Morgantown, W. Va., was dedicated May 14; the Secretary of the Interior delivered the principal address.

Chemistry and refining.—Noteworthy progress was made in all current phases of the Bureau of Mines petroleum-chemistry, refining, and thermodynamics program at the Laramie, Wyo., and Bartlesville, Okla., stations.

A study on nitrogen in petroleum was initiated during the year; the major objective was quantitative identification of nitrogen compounds in certain crude oils. Progress was made in concentrating and separating the nitrogen compounds in a Wilmington, Calif., crude. In a supplementary phase of the work two pure nitrogen compounds were prepared as standards for research groups.

A study of sulfur in petroleum resulted in identification of 2 sulfur compounds in Wasson, Tex., crude oil and of 2 in Wilmington, Calif., crude. Development of methods for separating sulfur compounds by types from complex mixtures was emphasized. In another phase of the work, 4 purified sulfur compounds, Nos. 29 through 32 in a series, were prepared during the year, and 5 standards, previously prepared, were distributed.

In cooperation with the Western Petroleum Refiners' Association and the Bureau of Ships, studies of the causes of storage instability of diesel-type fuels indicated that oxidation is a major cause of gum formation in distillate fuels, that oxygen-susceptible sludge-formers are concentrated in aromatic fractions of the fuels, and that, contrary to usual belief, polar materials in some cases inhibit sludge formation. The stability studies were extended during the year to include preliminary work on gasoline. Research on the combustion of diesel-type fuels provided tentative correlations of air-fuel ratio with ignition delay.

Surveys and reports on the quality of petroleum fuels included 2 on motor gasoline and 1 each on aviation fuels and diesel fuels. A survey of burner fuels was begun.

Analyses of 209 domestic and foreign crude oils were completed, and several publications were issued, including a comprehensive report to the Air Materiel Command that contains analytical data for about 94 percent of the oilfields in the United States now producing over 2,500 barrels daily.

Thermodynamics research, conducted in cooperation with the American Petroleum Institute and the Air Research Development Command, included nitrogen compounds for the first time. Measurements of heat capacities in solid and liquid states, heats and temperatures of phase changes, and entropy in the liquid state were completed for six pure organic compounds. Heats of combustion were determined for 9 compounds and for 4 sulfur and oil mixtures, and a special combustion technique for tetraethyl lead was developed. Heats of formation were determined for two fluorine compounds. Vapor heat capacities and heats of vaporization were obtained for 3 compounds, and vapor-pressure studies were completed for 2 compounds. Calibration of equipment previously constructed for pressure-volume-temperature relationship studies was completed, and measurements of neopentane were begun. A similar apparatus for use with gaseous materials was designed. Calculation of the thermodynamic functions of 2 compounds was completed, revisions based on new information were made for the functions of a third compound, and similar calculations progressed for 5 other compounds.

Petroleum and natural-gas economics.—The year was one of adjustment for the oil industry. By holding domestic production of crude oil to 2,316 million barrels while total demand rose to 2,959 million barrels, excessive stocks of both crude oil and products were largely liquidated. There were small increases—about 3 million barrels in each instance—in imports of both crude oil and refined products, bringing the respective totals to 239 and 144 million barrels.

The 52,925 wells completed and the 29,773 producing oil wells drilled during 1954 represented an alltime high. The degree of success obtained also rose, as 55.5 percent of the wells drilled resulted in oil producers last year compared with 54 percent in 1953. Despite the large number of wells drilled and relatively high ratio of oil producers, estimated reserves of crude petroleum increased only 616 million barrels during the year. This was one of the smallest increases since the end of World War II.

Marketed production of natural gas in 1954 was 8,667 billion cubic feet, 3.2 percent greater than in the preceding year and the smallest increase in recent years, reflecting the slowing in pipeline construction. The increase in proved reserves of natural gas (264 billion cubic feet to a total of 211.7 trillion) was also the smallest since World War II, although the 3,977 gas wells completed represented a record high.

OIL SHALE

Oil from oil shale.—During the past year laboratory work continued on the properties and composition of both oil shale and shale oil. Nearly 6,000 samples of oil shale were assayed, and logs of more than 200 sections of Green River shale were published. Studies on the composition of the organic matter (kerogen) of shales from Rifle indicate that there is little difference in the material from the various Green River shales of the region. Tests continued on partial solution of oil shale in various organic solvents. Up to 60 percent of the kerogen was soluble upon mild pyrolysis in selected glycols, but the portions going into solution in the various solvents have not been identified. Up to 70 percent of the kerogen was extracted by tetralin under similar conditions. Hydrogenation of kerogen in the presence of stannous chloride yielded up to 80 percent of the products soluble in benzene. The products were saturated hydrocarbons and neutral nitrogen, sulfur, and oxygen derivatives.

Work on the naphtha fraction of N-T-U shale oil has been completed, and the results will be published in a technical report. Progress has been made in the study of the gas-oil fraction. Identification of the major constituents by molecular distillation, thermal diffusion, and spectrometric analysis is underway. Characterization of the oils produced in the entrained-solids retort at high temperatures was begun.

In the work on the entrained-solids retorting method the effect of operating temperature on yield and composition of the products was studied in greater detail. Recycle hydrogenation of both crude shale oil and entrained-solids oils has been investigated further. The results indicate that better fuel may be obtained from all these products by mild hydrogenation.

In the first part of the year shale was mined to supply feed for the two pilot plants. A large rotary-drilling frame was designed and installed in the mine, and extensive tests on horizontal rotary drilling were planned. However, all activity terminated February 28 when a serious roof fall in the mine damaged some of the mining equipment. At the year end the mine remained closed, and a study of possible alternate mining methods was being made by a group of consultants appointed by the Director of the Bureau.

After preliminary shakedown tests, plants 2 (30 tons per day) and 3 (150 tons per day) were operated. Progress was made in plant 2 in determining good operating conditions and in studying the effect of artificial nucleation on size of oil droplets in the retort gases. In one series of tests in retort 3 good mechanical operation was achieved at a moderate rate of throughput, and good distillation of shale oil resulted. However, because of secondary cracking or failure to recover all the fine oil mist, the total yield of recovered oil was not as high as formerly obtained in the smaller retorts.

Experiments with the smaller pilot retort 1 (6 tons per day) gave additional support to the theory that addition of small quantities of sodium chloride as brine has considerable beneficial effect on the formation of shale-oil mist with a resulting increase in overall yield.

HELIUM

A record-breaking output of helium and specific plans to increase the production of this lightweight nonflammable gas by 50 percent were foremost among many attainments during the year.

Greater emphasis on this important responsibility of the Bureau resulted, with creation of a new organizational system under which all helium activities were centered under an Assistant Director, reporting directly to Washington with headquarters at Amarillo, Tex.

The 4 helium plants at Amarillo and Exell, Tex.; Shiprock, N. Mex.; and Otis, Kans., shipped 212 million cubic feet of helium, a gain of 25 percent over 1954. Approximately 70 percent went to Federal agencies and 30 percent to commercial customers. A survey disclosed that 90 percent of all helium is used for defense purposes.

Despite production above rated capacity, output fell behind demands, and the Bureau was authorized to invest $6 million in new facilities for extracting helium from certain natural gases.

New safety records were set simultaneously with the increased output, and outstanding marks were made by the plants at Amarillo and Otis. Citations were received from the Texas Safety Association and the National Safety Council.

For the first few months of the year helium shipments were limited because of a tank-car shortage. Better utilization of cars and acquisition of additional transportation equipment helped relieve the shortage of shipping containers. At the year end 17 helium tank cars were on order, and arrangements were made for the Bureau to operate and control all 107 Government-owned cars. Since approximately 80 percent of the older cars needed repairs, rehabilitation work was started under contracts awarded near the year end.

Plant security measures were strengthened by resumption of a 24-hour-per-day guard service at all plants in accordance with suggestions from the Office of Naval Intelligence.

Water encroachment reduced the production of wells serving the Navajo plant, and a contract was negotiated with Stanolind Oil & Gas Co. for delivering helium-bearing gas from a new field 8 miles from the plant. The Bureau estimates that the move will extend the life of the Navajo installations several years—perhaps 5 or more.

High helium demands and full production rates placed additional emphasis on plant engineering and development. Besides preliminary engineering design, feasibility studies, and cost estimates for new plants an improved helium-separation cycle was devised that promises considerable reduction in power requirements. Other developments included installation of automatic controls on helium-separation equipment, resizing of compressor cylinders to restore capacity lost by reduction of gas-supply pressure, regrouting of compressor foundations, installation of a pilot-size fractionation column to check data required in constructing a new plant, cleaning of cooling systems with chemicals, and installation of equipment to remove hydrogen in the final purification of helium.

A research group continued to analyze samples of natural gas from new fields and studied several areas to determine whether they could supply a new helium plant.

Other research included studies of helium liquefaction to simplify transportation, behavior of natural gases as an aid to process improvement and equipment development, instrumentation to improve process control and minimize operating manpower, and utilization of helium.

Estimated helium demands for the fiscal year 1956 are 20 percent higher than those for fiscal 1955, proportionately distributed between Federal and commercial users. During the first 6 to 8 months of fiscal 1956 demand was expected to be 20 percent greater than production, necessitating continued allocation of helium.

SOLID FUELS AND EXPLOSIVES RESEARCH

Last year, as in every year since its creation, the Bureau of Mines furthered technical progress in the mining, preparation, and utilization of the Nation's solid-fuel reserves and continued its authoritative studies of explosives and explosions. The year saw completion of the Bureau's portion of an inventory of the Nation's minable reserves of coking coal, start of research to determine whether atomic energy can help man obtain liquid fuels and chemicals from coal at low cost, and accumulation of new knowledge of the basic mechanisms involved in explosions.

Coal mining and reserves studies. Bureau engineers studied various types of continuous coal-mining machines during the year and suggested a method of applying a Canadian-developed machine to longwall mining in this country. They also observed longwall operations, in bituminous-coal mines, of four imported German coal planers under varying conditions of bed thickness and friability. Preliminary tests with the Bureau's vibrating-blade coal planer indicated that this type of machine can be used to mine anthracite. Tests are continuing to improve design and operation of the planer and accessory equipment.

Estimates of known recoverable reserves of coking coal were published for 5 counties, 2 in West Virginia and 1 each in Kentucky, Pennsylvania, and Tennessee. Reports for 14 additional counties were drafted as the Bureau terminated fieldwork in this investigation.

Coal preparation.—The Bureau continued studies to develop effective methods of cleaning and recovering fine sizes of coal Two types of equipment tested—a dense-medium cyclone cleaner and a feldspar jig—proved adaptable to this use. Changing the design of the cell used in the kerosine-flotation process for cleaning and dewatering fine coal increased its capacity.

Preparation characteristics of coking coals from counties in West Virginia, Kentucky, and Tennessee were given in reports which also discussed the possibility of upgrading these coals to present metallurgical standards. Work continued on coals from other counties in these States.

Commercial-scale crushing tests of Chestnut-size anthracite indicated that ring- and gyratory-type crushing equipment gives best recovery of Buckwheat and Rice sizes. Power requirements for crushing and pulverizing lignite were determined, and factors causing lignite to freeze in railroad cars were studied.

Drying, combustion, and carbonization.—A pilot-scale entrained-bed drier and fluidized-bed carbonizer at Denver were used to produce chars from western coals for blending in the production of metallurgical coke. The same equipment was used in studies to develop more efficient methods for removing solids from hot distillation products. Observations continued at Rockdale, Tex., where nine 50-ton-per-hour driers used the Bureau's entrained-bed system to supply dried lignite to power boilers, and a prototype carbonizer was operated to provide tar and light oil which are being tested for properties and uses.

A comprehensive report on the technology of lignitic coals, including a review of European lignite technology, was published. A study showed that covering mine refuse piles with fine refuse material or clay would prevent or quench fires. An institutional-type incinerator to burn wastes with minimum emission of smoke and particulate matter was constructed and tested.

The Bureau's experimental blast furnace at Pittsburgh was employed to investigate possible metallurgical uses for anthracite. Production rate, fuel consumption, and sulfur content of the metal produced were favorable when anthracite was used in ratios up to 40 percent of the fuel burden. Anthracite showed promise when used in a metallurgical blast cupola in amounts varying from 10 to 40 percent of the anthracite-coke fuel charge.

Yield and quality of coke and products from 41 American coals and 33 blends were determined by the Bureau of Mines-American Gas Association carbonization tests. The Tuscaloosa and the sole-heated ovens were used to determine expanding properties of coals and blends, using inert materials such as anthracite fines and petroleum coke. Thermal and oxidation pretreatments of coals gave data on the basic mechanism of carbonization.

Coal-to-oil research.—With expiration of the Synthetic Liquid Fuels Act on April 4, 1955, laboratory-, bench-, and pilot-scale research on producing synthetic fuels from coal was integrated with the Bureau's other research and technologic work on coal.

Conversion of coal to liquid fuel by reaction with hydrogen at high temperatures in a 1-step instead of the conventional 2-step process was studied in a small, continuous reactor. Conversion of coal to oil was nearly complete, but the product was mostly heavy oil with relatively small yields of gasoline and gaseous hydrocarbons. Similar products were obtained in pilot-plant tests of this process, but difficulties due to overheating were encountered, necessitating redesign of the reactor.

Progress was made in research to gain a better understanding of the structure of coal, which can lead to development of methods for converting coal to other useful substances. Carbohydrates, cellulose, and lignin (with or without hydrogen) were heated or treated with sulfuric or phosphoric acid to produce coallike chars. Infrared absorption spectra were used to compare coal fractions with products from coal hydrogenation, petroleum asphalt, and gilsonite and to follow structural changes during coal carbonization. Examination of coal by X-ray diffraction indicated the presence of minute crystals—additional proof that coal is composed of material that has a recognizable structure. Research was begun on microbial degradation of coal and related substances.

Steel turnings, the cheapest known catalyst for the Fischer-Tropsch process for converting synthesis gas into organic chemicals, were specially treated for one modification of the process in which cooling oil is pumped through the catalyst bed. Tests showed that the turnings were an excellent catalyst for this oil-circulation process, that the active surface layer of the catalyst was largely converted to iron carbide early in the synthesis, and that the carbide content then remained essentially constant, but metallic iron slowly oxidized to magnetite.

In experiments to develop improved methods of activating and pretreating catalysts, turnings that were carbided or nitrided before synthesis had relatively low activity, but subsequent oxidation and reduction resulted in high activity. Higher activity was observed with a steel containing copper and with oxidized turnings of carbon steel impregnated with copper nitrate. Oxidized steel wool also was active.

Coal-to-gas research.—A pilot plant for gasifying coal with oxygen and steam at high pressures is being developed. In acquiring design data for the plant and its equipment, Bureau scientists are using statistical methods that enable them to test several variables at the same time, reducing the number of tests that must be made.

In cooperation with the Atomic Energy Commission the Bureau has begun research to determine whether nuclear energy can be used for gasifying coal with steam alone. The AEC plans to work on development of a reactor, and the Bureau will test materials and attempt to work out a practical chemical process for atomic gasification. Preliminary work already is in progress on analyzing products obtained with a model reactor heated by electricity.

What may prove to be a means of feeding coal into a high-pressure gasifier was developed from experiments in which slurries of powdered coal and water were passed through hot coils to vaporize the water and break the coal particles further. The rate of reaction of steam with carbon was measured in an apparatus that permited introduction of other gases, such as oxygen or nitrogen, and observation of coal particle size.

Tests with a vortex gasifier, in which unburned residues were recycled, pointed toward eventual reduction of materials requirements per unit volume of product gas. Bench-scale gasification tests of lignite gave data for the design of a pilot-scale unit for moderate-pressure gasification in a fixed bed of lump lignite with oxygen and steam at temperatures permitting liquid-slag removal.

Research on production of high-B. t. u. gas from synthesis gas produced from coal resulted in pilot-scale development of a fluidized-bed, multiple-inlet reactor that gave higher gasification rates and gas of higher heating value than fixed-bed reactors. Studies of methanation catalysts gave data on reactivation properties and useful catalyst life.

Work on gasification of unmined coal underground was reactivated in cooperation with industry at Gorgas, Ala., and a test was made to determine whether a hydraulic fracturing process used in oilfields is practical for opening passages in coal seams for gasification. Passages were opened in the coal bed by injecting a mixture of oil and sand. Permeability of the bed was increased 85-fold, and there was evidence that openings extended some 600 feet from the injection point. Gasification tests are in progress.

Coal constitution and analysis.—The Bureau's coal sampling and analysis work continued to provide the basis for the Government's coal-purchasing program. More coal-dust analyses were made in connection with inspections of coal mines, and other Bureau research programs required analyses of cokes, rock dust, slags, and other materials. Cooperation was continued with the American Society for Testing Materials and the International Organization of Standardization in development and standardization of methods of coal analysis. Cooperative work with the Economic Commission for Europe brought closer agreement on an international system of classifying lignite and brown coals. A Bureau-sponsored conference on coal microscopy reviewed recent developments in coal petrography and applications to coal-industry problems.

Services to the Government.—Advisory services to Federal agencies on installing, testing, and operating fuel-burning equipment continued. Boiler-water samples were analyzed for Federal agencies, recommendations made for proper treatment, and feedwater testing kits and special chemicals distributed. Assistance to State and municipal governments on air- and stream-pollution problems continued, and a new method of determining density of smoke emission from chimneys was compared with the long-used Ringelmann method.

Coal economics.—After hitting a postdepression low during the 12 months ended October 1954 production of bituminous coal began to climb steadily. However,- production of Pennsylvania anthracite continued to decline.

Statistical and economic research on solid fuels provided analyses of factors involved in coal's changing competitive position, in the volume and method of production and consumption, and in stocks, imports, and exports of coal. Special data were interpreted for estimating solid fuels mobilization requirements, including those for steel and other strategic industries. Important data on coal, coke, coal chemicals, foreign solid fuels, operations, and energy trends were provided to various members and committees of Congress and to other Federal and State agencies.

EXPLOSIVES AND EXPLOSIONS RESEARCH AND TESTING

Explosives testing and research.—During the fiscal year the Bureau made more than 2,800 tests of permissible and other explosives and hazardous chemicals; 168 explosives were on the active permissible list at the end of the year. Consumption of permissibles was about one-half million pounds more than in the previous year. The ratio of permissibles to black blasting powder was 15 : 1.

Revised testing schedules for blasting devices, stemming devices, and explosives were issued. A marked increase in the number of permissible field samples failing to meet minimum safety requirements led to a program for improving the safety of permissibles with a record of field-sample failures. To date, changes have been authorized in the formulation of four brands.

Measurement of the temperature of an exploding charge by means of its luminosity was used to develop further a theory of the detonation of explosives. Such measurements were made for PETN, tetryl, RDX, and TNT. In studying firedamp ignition by explosives, such factors as charge weight, borehole geometry and loading, stemming, and atmospheric humidity were investigated.

Photographic evidence was obtained of a possible mechanism in the detonation of gas mixtures.

Dust- and gas-explosion research.—Explosibility of 75 mineral and industrial dusts was evaluated, and wire-screen coverings for vents in industrial equipment were studied as a means of simultaneously relieving pressure and quenching flame in dust explosions.

The effectiveness of wet rock dust as an antiexplosion measure was tested in the Bureau's Experimental mine at Bruceton, Pa. Tests were made on natural gas-air mixtures at high pressures to determine the hazards of igniting mine atmospheres that may be drawn into compressed-air coalbreakers.

Flammable gases and liquids tested for explosive properties included hydraulic fluids used in aircraft or naval vessels, industrially important straight-chain saturated alcohols, aromatic and paraffin hydrocarbons, and various organic compounds.

In research on ignition and combustion processes, several long-range studies on the oxidation of hydrocarbons were concluded. Oxygen also was found to play an important role in the exchange reaction between hydrogen and deuterium. Investigation of flame structure and behavior continued, with emphasis on the development of new techniques for studying the structure and propagation of turbulent flames.

As in previous years, assistance was given Government agencies, municipal authorities, and industries in tracing the origin of explosions and fires, such as the U. S. S. *Bennington* disaster, and in eliminating potential accidents due to gas leaks; improper handling and storage of hazardous materials; and other causes.

HEALTH AND SAFETY

Bureau of Mines activities for safety and health in the mineral industries were reorganized during the year to provide direct supervision from Washington. In December the principal field offices were designated health and safety offices reporting to the Assistant Director—Health and Safety.

Investigations to determine the causes of accidents and injuries and recommendations for eliminating them continued to meet with success as reflected by improved safety conditions.

The inspection of coal mines and enforcement of the Federal Coal Mine Safety Act of 1952 saw correction of many hazardous conditions and noticeably better accident records. Training of workmen and supervisors in recognizing and eliminating dangers was accelerated.

One coal-mine explosion classed as a major disaster occurred during the year.

Work on primary hazards.—The most serious hazards are those involving roof and haulage. Roof falls caused 55 percent of all fatalities in coal mines in 1954 and haulage accidents another 23 percent, or 78 percent from both. A national campaign to reduce the number killed and injured by falls of rock and coal was undertaken jointly by the Bureau and mineral-industry organizations. Favorable results are expected.

Roof bolting, a method of support that the Bureau introduced to the coal-mining industry in 1947, has proved its effectiveness in preventing roof-fall fatalities and continues to gain wide acceptance. During the year 120 underground mechanized coal mines used roof bolts exclusively, and 26 percent of the entire production of bituminous-coal mines came from roof-bolted areas. Significantly, of the 177 roof-fall fatalities in bituminous-coal mines during 1954, only 2 resulted from failure of the bolts to hold the roof.

In future the risk of failure of bolted mine roof may be lessened by using a safety device known as a roof-bolt compression pad. Seeking to make roof-bolting installations more reliable, the Bureau developed during the fiscal year 1955 a rubber-in-steel bearing plate. A similar device now is in volume production by industry and promises to be an effective warning of impending failure of bolted roof.

Recent field and laboratory tests provided information for determining anchorage effectiveness, torque-tension relationship, and load-carrying capacities of different bolts and expansion shells normally used in mines. A report describing the Bureau's findings will be available to the mining industry during the coming fiscal year.

The Bureau conferred during the year with mining-company officials, inspectors of State mining departments, and engineers from various parts of the United States and foreign countries on roof-bolting and roof-control problems. Roof-bolt installations in all districts were surveyed, and reports were submitted to miners' unions, operators, and State inspectors. Other phases of roof control included studies of extensible canopies, shields on continuous mining machines, curved jacks for longwall continuous mining machines, and bonding and roof painting.

Tests of equipment.—The Bureau's electrical-mechanical test work contributed greatly toward increased safety in coal mines.

During the year 165 approvals and 2,043 extensions of approvals of electrical equipment were granted, and a study was continued on safe lighting for gassy or dusty mines.

To assist the Navy in eliminating fire and explosion hazards on aircraft and in ships the Bureau tested 12 electrical components and 3 aircraft fuel gages.

Other research centered on diesel-powered equipment and fire resistance of conveyor belts.

Gas-ignition and fire hazards from portable electrical cables constitute major problems that Bureau researchers are planning to study more intensively in coming months.

Seventeen approvals and 20 extensions of previous approvals were granted for dust collectors for use in drilling rock in coal mines. One new approval was issued on an air-line respirator, and 41 extensions of approval were granted on respiratory protective equipment. Apparatus was developed for testing respirators against paint-spray mists.

A new Experimental coal mine was essentially completed on Government property at Bruceton, Pa., and will be used for testing drill-dust collectors and other studies of mine-dust problems.

Health.—Activities concerned with health research continued to yield direct benefits to the mining and allied industries. Promotion of safer and more healthful working conditions helped conserve manpower, its most valuable resource.

The continuing study of the composition of mine atmospheres provides the Bureau of Mines with information on this subject accumulated on a nationwide basis. The results obtained in this work are available to State mining departments, the mining companies concerned, and the miners' unions. In connection with recovery operations at a West Virginia coal mine after an explosion Bureau experts made many gas analyses at the scene and facilitated reopening of the mine.

In addition to this field assignment, laboratory technicians analyzed over 18,000 additional gas samples, most of which had been obtained in the coal-mine-inspection program. Others were collected from sealed fire areas in coal mines, metal and salt mines, tunnels under construction, and coal-preparation plants or in connection with tests of diesel and butane engines and decomposition of plastics and conveyor belting.

Studies continued for the Navy's Bureau of Ships to determine ignition and burning characteristics and the nature and volume of toxic gases produced by combustion or thermal decomposition of plastic materials.

On behalf of a committee consisting of Bureau personnel and representatives of conveyor-belt manufacturers, coal operators' associations, the miners' union, and the State of Kentucky tests were conducted to determine the gaseous products formed by burning or thermal decomposition of conveyor belts. Work of the committee resulted in a proposed schedule of acceptance requirements for fire-resistant belting.

A special infrared spectrometer was installed to determine both qualitatively and quantitatively the type and amount of explosive gas in coal-mine atmosphere.

Control of dust produced by continuous-type mining machines is one of the problems confronting the coal-mining industry. In addition to analyses of hundreds of mine-dust samples obtained underground the Bureau began to study the behavior and flow pattern of air currents as related to dust transport. A scale model of two connected mine entries was constructed for this project. Other researchers observed the effects of various types of spray nozzles as dust suppressors and arranged to conduct field studies of this problem.

A survey was completed during the year of dust-control measures in the coal-mining industry which showed that about 24 percent of the mines practice some form of dust control. Information provided by the more than 3,400 replies to a questionnaire on dust control was prepared for publication.

At the request of the International Labor Office, Geneva, Switzerland, an annual summary was prepared reviewing methods of dust prevention and suppression in mining, tunneling, and quarrying.

A major portion of the American Standard Code concerning respiratory protection was rewritten by Bureau personnel serving on an ASA sectional committee named to correlate material on head, eye, and respiratory protection.

Complete ventilation surveys for three coal mines were made. Records of a study of the effect of barometric-pressure changes on the emission of explosive gas in caved areas of an Illinois coal mine were analyzed, and a manuscript was prepared for publication. A study was begun of the effectiveness of bleeder entries in keeping caved areas in coal mines free of methane accumulations.

Accident analysis.—Surveys of accident trends and causes continued to play essential roles in the Bureau's long-range program of curbing injuries in the mineral industries. Injury statistics and employment figures were obtained in the coal, coke, quarrying, metallurgical, nonmetallic-mineral, and petroleum and natural-gas industries.

In addition to preparing publications for industry, agencies of the Federal and State Governments, unions, trade associations, and others interested in safety promotion, Bureau statisticians arranged special reports that aided Federal coal-mine inspectors in their work.

The 30th National Safety Competition and 4 other safety competitions were conducted during the year under sponsorship of trade associations of the mineral industries. Approximately 1,500 mines, quarries, and other mineral plants were enrolled in these contests, and some 2,000 Certificates of Accomplishment in Safety were prepared and presented the employees and managers at the plants.

Other accomplishments included the annual canvass among manufacturers of industrial explosives, preparation of three Minerals Yearbook chapters regarding injuries and related employment experiences, and release of monthly reports on the fatal- and nonfatal-injury experience at coal mines.

During the year the Branch of Accident Analyses in Washington took over work previously handled by the Statistical Service Branch at College Park. The transfer resulted in substantial savings.

In the coming year deadlines will be advanced for completing and issuing statistical information without increasing personnel or equipment.

Safety education.—The year saw increased activity in the organization of accident-prevention classes among coal-mining men. Since 1947 approximately 125,000 persons have taken the Bureau's 20-hour training course. Although instruction is primarily for workmen, it has helped morale when both supervisory officials and workmen take the course together. In fact, recent emphasis has been placed on 100-percent participation by both groups.

During the coming year the Bureau will further emphasize 100-percent training wherever an accident-prevention training course is given. The ultimate goal is to make the training available to each person who goes underground in the coal-mining industry. In the coming year the Bureau also will continue accident-prevention training for the mining industry other than coal and for the petroleum and natural-gas industries.

Special efforts were made during the fiscal year 1955 to promote organization of Holmes Safety chapters and councils. The campaign resulted in creation of 130 such chapters and 6 councils. These promote safety because they encourage the discussion of accidents and safety measures by men and management.

The Bureau's goal is safety training for every workman and official in the coal-mining industry and retraining at regular intervals.

Coal-mine inspection.—This year marked the third complete year under the Federal Coal-Mine Safety Act, which consists of title I (the original Federal Coal-Mine Inspection and Investigation Act of 1941, with slight changes) and title II (containing certain mandatory provisions designed to prevent explosions, fires, inundations, and man-trip and man-hoist accidents in coal mines regularly employing 15 or more persons underground.)

There were approximately 8,400 active coal mines in the Nation in 1954, including 1,570 title II mines, 5,515 small title I underground mines, and 1,275 strip mines. At the end of the fiscal year 1955 the Division of Coal-Mine Inspection had 258 coal-mine inspectors, 45 engineers, 9 coal-mine electrical inspectors, and other supporting personnel variously assigned in coal-mine inspection and safety educational work.

During the year 3,595 regular inspections were made of coal mines covered under title II of the act, including 52 made jointly with State inspectors in States that have entered into cooperative agreements with the Bureau under the act. In addition, 2,794 special inspections were conducted to determine the abatement status of violations cited under title II. Inspectors observed 8,230 violations of the safety provisions of title II during these inspections. Many were corrected immediately, obviating the need for issuing formal notices of findings; however, the Bureau issued 3,063 original notices setting a reasonable time for abating dangers not corrected promptly, 523 notices granting time extensions, and 3,041 notices certifying that the dangers had been abated.

Orders requiring the withdrawal of men were issued at 100 mines, 84 orders at 59 mines under the act's imminent danger clause and 71 orders at 41 mines for failure to show good faith in abating violations within a reasonable time. In addition, 21 orders were issued classing heretofore "nongassy" mines as "gassy." However, five of these orders later were annulled by the Director or the Federal Coal-Mine Safety Board of Review, an independent agency set up by the act.

Federal inspectors and engineers also made 6,827 inspections of the smaller title I mines, including 595 inspections of strip mines; 1,012 technical surveys of electrical, ventilation, dust, blasting, and other practices and conditions; and 625 special investigations of fatal and serious nonfatal accidents and mine fires and gas and dust ignitions.

During the fiscal year 1955, 7 applications for annulment of gassy-classification orders issued under the act were made to the Director; 6 were denied, and 1 was annulled. The Board received three applications for annulment of gassy classification, all appealing adverse decisions by the Director. The Board annulled one order, and the Director has petitioned the United States Court of Appeals. A hearing is pending.

The Board also received two applications for annulment of withdrawal orders. One, issued under a State-participation plan, was annulled upon abatement of the violation. The other, appealing an adverse decision by the Director, was annulled following a hearing. This action was appealed by the Director to the Federal Court, which dismissed the litigation because it was not filed within the 30-day limit.

One major disaster, a widespread explosion and coal-mine fire that caused the death of 16 men, occurred during the year. This is the second major disaster (one in which 5 or more persons are killed) in 3 years of operation under the antidisaster provisions of title II of the act. The other was a dust explosion, which in 1953 caused 5 deaths.

Preliminary figures indicate that the number of fatalities in coal mines dropped from 460 in 1953 to 395 in the calendar year 1954, but the frequency rate per million man-hours of exposure increased from

0.84 to 1.04. During the first 6 months of 1955 the preliminary fatality frequency rate was also 1.04. This unfavorable trend is usually experienced during periods of tight markets and marginal operation of coal mines and is influenced by the decreasing man-hours now required for coal production.

Control of fires in inactive coal deposits.—Since 1949 the Bureau of Mines has engaged in controlling fires in inactive coal deposits on private property and the public domain.

Of the 196 known fires in inactive coal deposits, 46 have been controlled or are being controlled. Of these, 26 are on the public domain and 20 on private property. The Bureau estimates that one quarter of a billion tons of coal have been conserved at a cost to the taxpayers of less than 1 cent a ton.

During the year 8 fire-control projects were completed; 6 were on the public domain and 2 on private property. Five additional fires were being controlled at year's end.

New fire-control projects will be started during the coming year under funds appropriated by the Congress.

RIVER-BASIN ACTIVITIES

The Bureau continued to cooperate with other Federal, State, and private agencies to develop resources of United States river basins. Bureau investigations assured that the mineral industry and mineral potential in each region received adequate consideration in planning water and power development.

Arkansas-White-Red River Basins.—Bureau field studies of all the more important mineralized areas in these basins culminated in a comprehensive report, Minerals and Geology of the Arkansas-White-Red Basins, written by Bureau engineers in cooperation with the Federal Geological Survey and various State officials. Presenting long-range plans for developing the mineral resources of the area, it was part of an all-resources inventory report and development plan for the basins requested by the Congress in the Flood Control Act of 1950. The entire report by all agencies was completed in June 1955.

Five special treatises describing in detail the mineral situation in major subareas were submitted to cooperating agencies, as were many special reports on mineral resources in specific proposed water- and power-project areas.

Procedures used in evaluating mineral-production losses because of inundation in reservoir areas were studied and the findings incorporated in a preliminary report.

Missouri River Basin.—Continuing lignite-storage studies revealed that weathering of the surface of lignite piles causes heating, which is aggravated by wind and drifting of lignite dust, making erection of "snow fences" and periodic leveling of drifts necessary. Carbonization and tar-yield studies were made of samples from many lignite deposits.

Commercial development of petroleum and natural gas in the Missouri Basin was exceptionally active during the year. Brought into production were 4,205 new wells, 122 new oilfields, 50 new gasfields, 6 natural-gasoline plants, and 3 refineries. Reports on petroleum and natural gas in the Williston Basin, the Cheyenne River Division, and the Missouri-Souris Division were prepared for the Missouri Basin Field Committee.

Seven reports on metallic and nonmetallic resources of the Basin were presented to the committee. They included: Mineral Resources of the Powder River Division (Montana and Wyoming), Missouri Basin Chromite, Cement Industry Feasibility Study, A Review of the Aluminum Industry, Gypsum in Wyoming and Colorado, Lightweight Aggregates in North and South Dakota, and Mineral Resources in the Northern Missouri Coal District.

New England-New York Survey.—In cooperation with the Federal Geological Survey and State geologists, mineral-industry studies were prepared for inclusion in a 46-volume resources inventory and development plan prepared by the New England-New York Interagency Committee.

A study of sources of waterborne mineral wastes was conducted in the New England-New York work. In this study mineral wastes were inventoried and sampled at 1,025 mineral-industry plants. Technical assistance was given at several plants.

Other river basins.—Special studies, reviews, and reports were prepared for many other areas, including Alaska, in connection with water and power development, both Government and private.

FOREIGN ACTIVITIES

As the gap between domestic production and domestic consumption of many mineral commodities has continued to widen, work of the Bureau's Foreign Activities Division came into sharper focus during the year.

Bureau undertakings in this field include foreign fact-finding and analysis, technical assistance to underdeveloped countries, and training of foreign technologists in Federal laboratories. The importance of these phases of the Bureau's work has been growing in recent years, reflecting great contribution by foreign sources to United States mineral supply, expanding investment by American capital in the development of foreign minerals, and active participation of our Government in international economic affairs. In recognition of this trend, the activity was given division status in reorganization of the Bureau on January 1, 1955.

Service to industries.—American industries, planning future operations, drew heavily on the Bureau's ability to analyze foreign mineral developments and their effect on the economy of this and other countries. The extent of utilization of foreign-produced minerals by the land of origin and by competing nations, the probability of increased or decreased output, technologic advancements, and market trends for American-made mining machinery and related equipment—all entered into the fact-finding program of the Bureau's specialists.

During the fiscal year 1956 a small increase is planned in the headquarters staff of foreign minerals specialists in Washington and in its corps of expert observers assigned to nations where developments in the production and utilization of minerals are significant. The expansion is necessitated by the growing number of requests from industry, other Government agencies, and foreign governments for data and advice on international mineral affairs and reflects congressional instructions to certain Federal agencies concerned with foreign minerals to look to the Department of the Interior for information and guidance.

Investments by American business in the development of foreign mineral resources appear destined to grow with the rapidly increasing demand for minerals in the United States. Depletion of resources has combined with growing industrial demands in recent decades progressively to widen the gap between production and needs in several raw materials. Examples of primary importance are copper, lead, zinc, and petroleum, which now are imported in substantial quantities, whereas before World War II the United States was virtually self-sufficient in these vital commodities.

Technical assistance.—In cooperation with the Foreign Operations Administration (now the International Cooperation Administration) the Bureau conducted technical-assistance projects in 11 countries—Afghanistan, Brazil, Colombia, Cuba, India, Israel, Liberia, Mexico, Pakistan, Peru, and the Philippine Islands. In the fiscal year 1956 projects will be undertaken in Egypt and Indonesia, and work at Nepal will be resumed after a year's lapse. Most of these assignments are filled by a single specialist for each country, who serves in an advisory capacity. The Bureau considers accomplishments in technical progress and in consolidating good will with the host countries to be outstanding, even though the outlay for such services has been modest.

From time to time, technical assistance is provided under direct contracts with foreign governments at their expense in fields where the Bureau has specialized knowledge not available from private consultants. Typical is an agreement with Brazil under which unique knowledge attained by the Bureau in the field of oil-shale mining and retorting is helping Brazil in developing her oil-shale resources. During the year Brazilian officials expressed appreciation for the help received and requested a 2-year extension of the contract.

Foreign trainees.—The training of mineral technologists from foreign countries in the laboratories, pilot plants, and other installations of the Bureau continued as an important part of the Government's foreign-assistance program. During the year 12 trainees from 7 African, Asiatic, and Latin American countries completed courses ranging from a few months to a year. At the year end 11 were receiving such training, and plans call for doubling the number next year.

Almost without exception, men trained by the Bureau have attained positions of high responsibility upon return to their native lands and have continued to maintain friendly relationships with their former associates and instructors. Exchange of technical information has been mutually helpful.

MINERAL ECONOMICS

The Bureau's long-range analyses of economic factors affecting the mineral industries became increasingly significant during the year. Special emphasis was placed on methods of expanding supplies, both domestic and foreign, to meet emergency conditions and estimation of total requirements and use patterns in peace and war.

Studies were undertaken to determine major economic factors influencing the welfare of the lead and zinc, antimony, fluorspar, and coal industries. Factors investigated included long-term domestic and foreign market trends, imports, domestic and foreign primary and secondary production, and relations among national economic activities and prices, production, and consumption of these commodities. Various potential assistance programs were evaluated and estimates made of their cost to taxpayers and consumers and the probable benefits to the mining industries and the industries serving them. Possible consequences of these proposals on price and cost structures and consumption patterns also were estimated.

In studying foreign supply factors for other minerals, trends of imports, the impact of tariffs on imports, and Government actions concerning international trade in minerals were under continuing analysis and review. The role of foreign supply was assessed as part of the total resource base for individual minerals. Long-run results of foreign trade-liberalization policies on prices of minerals and on foreign investment in minerals and potential aftereffects of built-up foreign capacity were summarized.

Research in minerals taxation involved such items as the treatment of expenditures at various stages in developing mineral properties, financial relationships between percentage depletion and loss carry-over, and estimation of the effect of different percentages of depletion allowance on mineral production, exploration, and development. The relative tax advantages of selecting oil payments as against an overriding royalty were computed for specific situations. Many tax proposals were examined in cooperation with the Treasury Department to determine their effects on mineral industries.

Assistance was given the newly created Office of Minerals, Mobilization. Analyses were made of the supply-requirement position of the Nation for certain critical metals and minerals under partial and full mobilization. Work was begun to establish mobilization programs and to estimate their economic implications for all critical minerals. Economic analyses for reports to OMM were completed on antimony, fluorspar, battery-grade manganese, tungsten, and selenium.

The Bureau's contribution to the Federal interindustry research program neared completion with publication of final reports on demands for and plant-investment requirements of selected strategic minerals.

PUBLIC REPORTS

Keeping industry, educators, research workers, and others informed of its advances in mineral technology, the Bureau of Mines continued to issue many formal reports during the year in fulfilling a basic requirement of its organic act.

The 653 manuscripts approved and edited during the fiscal year 1955 compared with 587 the previous year and were related to all phases of the agency's work.

Among the 215 reports sent the Government Printing Office were 99 technical bulletins, 94 Minerals Yearbook chapters and 3 bound volumes with extensive indexes, and 19 miners' circulars, handbooks, and miscellaneous guides. The 163 manuscripts prepared for processing included 85 reports of investigations and 35 information circulars—13 more than in the previous year—together with 15 issues of Mineral Trade Notes and 28 miscellaneous reports, such as materials surveys and chapters of the Bureau's Administrative Manual. In addition, 275 papers for technical and safety societies and articles prepared for the trade and technical press were edited.

During the year the Bureau's industry-sponsored technical-educational motion pictures continued in high demand and were used in thousands of schools throughout the Nation and in Alaska and

Hawaii in regular audiovisual programs. Films were shown 210,103 times to more than 57 million persons, either at group showings or on noncommercial television programs, compared with approximately 31 million the previous year. The number of individual prints available for circulation increased 11 percent, but demands for films remained higher than the availability of copies.

Texas and Its Natural Resources, one of the most popular films in the Bureau's library, was revised during the year, and several new subjects were in production at the year end.

Besides Pittsburgh, Pa., Bureau films were circulated through nearly 200 nonprofit subdepositories at leading educational institutions, libraries, visual aid centers, and Armed Forces installations.

ADMINISTRATION SUMMARY

Following detailed studies of the activities and organization of the Bureau of Mines, changes in its organizational structure were made during fiscal 1955. The number of regions was reduced from 9 to 5; helium activities were separated from other Bureau functions and placed under an Assistant Director; all health and safety activities were placed under direct supervision of an Assistant Director with divisions for health, safety, and coal-mine inspection; a program staff was created in the Washington office in charge of an Assistant Director; and a Division of Foreign Activities was set up. During the year, management of the Bureau's anthracite program was placed under direct charge of the Division of Solid Fuels in Washington.

A summary of Division of Administration activities follows:

Property

Property inventories were completed at all Bureau stations during the year. A central warehouse was set up in Denver, Colo., for storing heavy equipment needed in future programs. Also, central drill-core-storage warehouses were established at Denver Colo., and Minneapolis, Minn., and an area drill-core-storage warehouse at Bauxite, Ark. The Bureau's motor-vehicle fleet had been reduced by 67 at the year end—almost a 7-percent cut from the previous year's 988—without impairing efficiency. Still further reductions are planned. The Bureau disposed of $175,000 in excess property during the year and collected $9,790 from the sale of scrap.

The Procurement Manual was distributed and is in use throughout the Bureau.

Property records of the Bureau of Mines, as of June 30, 1955, show accounts as follows:

Automotive equipment	$2, 122, 819. 04
Canvas, composition, leather, and rubber goods	21, 270. 10
Drafting and precision-engineering instruments	120, 751. 38
Electrical equipment	528, 523. 86
Hardware	526, 265. 10
Household furnishings	134, 910. 73
Laboratory apparatus and appliances	8, 078, 513. 38
Medical and surgical appliances	60, 384. 36
Office furniture, appliances and floor coverings	2, 845, 431. 82
Photographic and projection apparatus	346, 457. 01
Powerplant and general shop equipment	4, 309, 477. 73
Real estate	31, 212, 821. 37
Specialized equipment	5, 866, 354. 56
Total	56, 173, 980. 44

A records-control schedule, covering departmental records, field records, and general administrative records, was issued as a guide in carrying out the Bureau's records-management program.

Finance

One of the primary results obtained from the cost-finding accounting system of the Bureau, which has been in operation for the past fiscal year, is data on the costs of maintaining various facilitating services throughout the Bureau. Information has been developed that will aid materially in effecting economies in overhead expenses, which in turn will provide more efficient utilization of the funds appropriated for research work.

The total funds available to the Bureau of Mines for the fiscal year ended June 30, 1955, including direct appropriations, prior year balances available, reimbursements, advances, and transfers from other Government agencies, proceeds from helium operations, and contributions to trust funds from non-Government sources, were $38,432,721. Of this amount $27,796,105 was obligated, leaving an unobligated balance of $10,636,616, much of which was construction money destined for a new helium plant.

Funds available to the Bureau of Mines for fiscal year 1955, by source of funds

Direct appropriation	$25, 481, 000
Prior year balances available	4, 224, 843
Less transfers and returns	—1, 453, 424
Reimbursements from other Government agencies	219, 652
Advanced or transferred from other Government agencies	5, 408, 467
Proceeds from helium operations	4, 095, 952
Contributions from trust funds from non-Government agencies	456, 231
Total, Bureau of Mines	38, 432, 721

Obligations incurred by the Bureau of Mines in the fiscal year 1955, by appropriation

Conservation and development of mineral resources	$13,297,250
Health and safety	5,045,183
Construction	106,967
General administrative expenses	960,762
Working funds (includes all consolidated and allocated working funds)	5,222,714
Administrative expenses, Mutual Security Act, executive (transfer to Interior)	26,970
Technical assistance, American Republics and non-self-governing Territories of the Western Hemisphere, executive (transfer to Interior)	[1] —4,247
Technical cooperation, general, executive (transfer to Interior)	283,756
Mutual defense financing, defense support, economic and technical assistance, Formosa and the associated States of Cambodia, Laos, Viet Nam, executive (transfer to Interior)	424
Mutual defense financing, defense support, economical and technical assistance, Europe, executive (transfer to Interior)	2,580
Economic and technical assistance, defense support, Asia and Pacific other than Formosa and the associated States of Cambodia, Laos, and Viet Nam, executive (transfer to Interior)	44,244
Economic and technical assistance, Near East and Africa, executive (transfer to Interior)	[1] —1,338
Development and operation of helium properties	2,378,100
Contributed funds	432,740
Total obligations incurred	27,796,105

[1] Disbursement less than carryover obligation.

Personnel

Reorganization.—The reorganization required considerable personnel planning and oral and written instructions to both the Washington office and the field and a tremendous amount of processing, which involved, for the most part, the preparation of numerous position descriptions and an unusually large number of personnel actions to reflect current assignments under the reorganization.

Manual.—Nine chapters of the Bureau of Mines Manual were issued. In addition seven chapters were completely revised in line with current statutes and regulations.

Schedule and number of paid employees

	GS	CPC	Ungraded	Total
Departmental	581			581
Field	2,937	97	647	3,681
Total	3,518	97	647	4,262

Classification.—Greater emphasis was placed upon desk audits of positions, field surveys and inspections, and conferences and discussions with supervisors and employees to assure compliance with classification procedures. In line with this emphasis on-the-spot studies were conducted of positions at 12 field stations.

Employee safety.—Efforts have continued to reduce to a minimum the number of accidents and the severity of resulting injuries in all phases of Bureau operations. A report of accidents and man-hours of exposure was devised to show accident cause and injury classification as an aid in directing accident-prevention efforts.

Incentive awards.—Following are some of the attainments under the incentive award program showing increased employee participation and increased savings to the Government:

Number of suggestions received during the year	245
Number of suggestions receiving awards	66
Total of cash awards granted	$1,160
Suggestions resulting in estimated annual savings	19
Total of estimated annual savings	$72,297.50
Suggestions that resulted in intangible savings	47

OFFICE OF OIL AND GAS

Hugh A. Stewart, *Director*

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THE Secretary of the Interior and the Assistant Secretary, Mineral Resources, were leaders in obtaining coordination of oil and gas policies and the administration thereof, and provided leadership in serving as channel of communication with the petroleum and gas industries.

They were active participants in meetings of the Defense Mobilization Board and the Presidential Advisory Committee on Energy Supplies and Resources Policy. In February 1955, the President's Advisory Committee made its report and recommendations aimed at strengthening the national defense, providing orderly industrial growth, and assuring energy supplies for our expanding national economy and for any future emergency.

They participated in meetings of the National Petroleum Council and the Military Petroleum Advisory Board, both industry advisory groups, established by the Secretary of the Interior, from which the Federal Government receives advice and information on a wide range of petroleum and gas matters affecting the national economy and the defense of our country. In addition, they have personally presented the Department's important oil and gas policies and views with respect to significant departmental activities directly to the Congress, and to the petroleum industry in public addresses.

The Secretariat was supported by the Office of Oil and Gas, where through the Director and the Federal Petroleum Board, the Department maintained active and close cooperation with the States in enforcement of their oil and gas conservation laws through administration of the Connally Act, and by the regular participation of the Director, as the Department's official representative, at meetings of the Interstate Oil Compact commission.

Executives of this Office were engaged in the work of the North Atlantic Treaty Organization Petroleum Planning Committee and its Working Group, and participated in several meetings held in Europe. An Assistant Director of this Office served as adviser to the United States Delegation at meetings of the NATO Petroleum Planning Committee and an executive of the staff was chairman of the Working Group.

Through the Office of Oil and Gas the National Petroleum Council has cooperated with the Federal Government for almost 10 years. The NPC provided valuable reports on the petroleum productive capacity of the United States, petroleum imports, petroleum storage capacity, shale oil, use of radio and radar in the petroleum industry, and matters concerned with assuring an adequate petroleum supply in event of an attack upon the United States.

Also, the National Petroleum Council published two important manuals as a service to Government and industry. One, Disaster Planning for the Oil and Gas Industries, is a manual primarily for use of management in connection with disaster planning. It contains ideas and suggestions to guide companies in the formulation of plans and programs of advance preparations to reduce damage to and facilitate the rehabilitation of refineries, and in providing continuity of company operations in event of disaster. The other manual, Security Principles for the Petroleum and Gas Industries, is a guide for industrial defense planning for use at the plant level to provide uniformity, eliminate inconsistencies, and furnish policy guidance for establishment and administration of security programs in the oil and gas industries.

Through the Office of Oil and Gas in cooperation with the Military Petroleum Advisory Board, the Department of the Interior, the Department of Defense, and the Office of Defense Mobilization have for their guidance the first petroleum report ever prepared which considers enemy attack damage resulting from the use of ultramodern weapons of warfare. That report is a milestone in petroleum defense preparedness planning. The report is the basis for many detailed technical studies under way by this Office and committees of MPAB.

Functions and responsibilities authorized by the Defense Production Act of 1950, as amended, vested in the Secretary of the Interior and delegated to this Office concern petroleum and gas. The Voluntary Agreement Relating to Foreign Petroleum Supply, as amended, dated April 15, 1954, and its implementing adjunct, the Foreign Petroleum Supply Committee, continued in existence throughout the fiscal year under the supervision and direction of a Director appointed from the Office of Oil and Gas by the Secretary of the Interior. Information covering foreign petroleum operations which is indispensable to Government was received throughout the fiscal year through the Committee and its four subcommittess, namely, Production Subcommittee, Refining Subcommittee, Supply and Distribution Subcommittee, and Statistical Subcommittee. These subcommittees gathered information and prepared reports on various aspects of petroleum operations in friendly foreign nations, pursuant to specific requests of the Secretary of the Interior or the Director of the agreement. These activities increased with progressive intensity during the fiscal year, primarily because of the increased requirements of the Department of Defense for foreign petroleum data for use in connection with strategic planning. The information and estimates supplied, covering more than 80 foreign nations and areas, concerned the foreign aviation gasoline supply position reported periodically on a 2-month forward basis, requirements of petroleum products for 1954 extended on a wartime basis through several years, crude oil producing operations under normal and wartime conditions, petroleum products consumption and supplies, petroleum refining capacity, and civilian terminal and storage facilities throughout the free world. These are comprehensive reports. Significant is the report on foreign civilian terminal and storage facilities which was the first of its kind ever prepared for use of Government. It consists of four volumes totaling 3,388 pages of statistical data on 1,084 terminals in 120 countries. Although the report was prepared at the request and mostly for the use of the Department of Defense, it was supplied to other Federal agencies having need for such data. As the fiscal year ended, the committees were working on revisions of this report, and on the preparation of other reports to comply with Government requests for information.

The Secretary of the Interior appointed 62 persons to serve on the Gas Industry Advisory Council which was available to obtain the advice and counsel of the gas industry in connection with the discharge of the defense responsibilities with respect to gas delegated to the Secretary of the Interior under the Defense Production Act of 1950.

Industrial expansion goals for expansion of the petroleum and gas industries were maintained throughout the fiscal year. Progress had been made toward reaching the goals which had been established for (*a*) increasing United States refining capacity, (*b*) increasing natural gas liquids capacity, (*c*) construction of additional alkylation facilities, (*d*) additional oil storage facilities, (*e*) construction of additional oil pipelines, and (*f*) expansion in pipeline capacity of the gas utilities industry. The petroleum and gas industries used the incentive of accelerated tax amortization provided by the Internal Revenue Code for expansion to meet the mobilization goals. This Office reviewed, analyzed, and submitted over 300 reports and recommendations to the Office of Defense Mobilization for approval or denial of certificates of accelerated tax amortization. Numerous requests for time extensions and scope amendments on certificates of accelerated tax amortization were analyzed and reports and recommendations were made to ODM. From time to time studies and reviews were made with respect to the expansion goals and the use of rapid tax amortization for petroleum and gas projects. Near the end of the fiscal year this Office had under way studies of each of the established goals to bring all information and data up to date to use as a basis for recommendations to the Office of Defense Mobilization for changes or modifications in the light of improved mobilization conditions.

This Office has cooperated with the Congress in furnishing information to Members of Congress and congressional committees, covering facts related to the petroleum and gas industries and their operations and the outlook for petroleum and gas supply both in times of peace and war.

The Office has membership on Department of Commerce committees which handle matters relating to export controls. A series of many meetings were necessary to develop and revise a master export security list, and other meetings were held frequently to consider matters on exports.

The Office gave advice and information to many Government agencies on matters involving petroleum and gas. These included the Executive Office of the President; Office of Defense Mobilization; the Departments of State, Treasury, Defense, Army, Navy, Air Force, Justice, Agriculture, Commerce, and Labor; the emergency agencies, Defense Transport Administration and Federal Civil Defense Administration; independent agencies, Atomic Energy Commission, Central Intelligence Agency, Civil Aeronautics Board, Federal Power Commission; as well as to representative of foreign governments.

The Department was represented at meetings of international petroleum organizations. The Secretary of the Interior, Assistant Secretary, Mineral Resources, and an executive of this Office represented the United States Government at the World Petroleum Congress, in Rome, Italy, in June 1955. The Director of this Office served as an official representative of the United States at a meeting of the Petroleum Committee of the International Labor Organization at Caracas, Venezuela, in April 1955.

In standardizing departmental nomenclature the Oil and Gas Division was redesignated as the Office of Oil and Gas. The change was effective April 6, 1955.

CONNALLY ACT ADMINISTRATION

The Office of Oil and Gas supervises the activities of the Federal Petroleum Board in administering the Connally Act. This act prohibits interstate shipment of oil produced in violation of certain State oil and gas conservation laws and orders issued thereunder. The Board initiated and conducted investigations, including holding of hearings, with respect to production and interstate shipment of such contraband oil with the view of supporting the oil and gas conservation policies of the respective States.

The Federal Petroleum Board, composed of a Chairman and two members, maintains headquarters at Kilgore, Tex. Suboffices are located at Midland and Victoria, Tex., and Lafayette, La. On January 1, 1955, the office formerly located at Houston was transferred to Victoria.

While the act is applicable wherever State laws limit the rate of production and prescribe conditions for producing and handling of oil, its chief application is in the States of Texas, Louisiana, and New Mexico, where regulations prescribed under the act are actively enforced. So far as possible with the resources at its command, the Board enforces the provisions of the act in other oil-producing States, particularly in Oklahoma, Mississippi, Kansas, and Arkansas. Enactment of legislation in 1955 by the Colorado Legislature brings that State within the purview of the Connally Act.

Producers, refiners, transporters, and others handling oil and products in a designated area are required to keep prescribed operating records and file monthly reports with the Board on approved forms. The designated area consists of 106 counties in the State of Texas, the counties of Lea and Eddy in the State of New Mexico, and the entire State of Louisiana.

From this designated area the Board received and processed, each month, approximately 7,233 monthly producers reports, about 493 monthly pipeline reports, and 76 reports from processors and refiners. These reports covered operations in 2,458 separate oilfields, and account for approximately 65 percent of the entire domestic production of crude oil in the States of Texas, Louisiana, and New Mexico, or approximately 3,968,000 barrels daily.

During the fiscal year, nearly 4,000 leases were inspected, some 2,900 leases were actually visited and checked, and 10 pipelines were checked. In the performance of this work, 645 oilfields were visited and 1,193 interviews conducted.

At the beginning of the fiscal year, 10 cases dealing with violations of the act were pending, 1 in an investigative status, 1 pending review by the Board, 3 under review by the Department of Justice in Washington, 4 pending disposition by the United States attorneys, and 1 was under review by the Solicitor's office.

Eight new investigations were started during the fiscal year. Nine cases were on the Board's docket when the fiscal year ended, of which five were in the investigative stage, two under review in the Solicitor's Office of the Department, one pending review by the Board, and one pending disposition by the United States attorneys.

During the fiscal year, one case was closed administratively without prosecution, and eight cases were closed by successful prosecution in the Federal courts, resulting in the imposition and payment of $86,400 in fines.

DEFENSE MINERALS EXPLORATION ADMINISTRATION

C. O. Mittendorf, *Administrator*

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THE Defense Minerals Exploration Administration continued to carry out during the fiscal year 1955 its program to encourage exploration for deposits of strategic and critical minerals in the United States, its Territories and possessions, under a delegation from the Office of Defense Mobilization to the Secretary of the Interior.

Assistance to private industry is provided under the program by the Government, through DMEA, participating in the costs of exploring for indicated or undeveloped sources of strategic and critical minerals. The Government participates to the extent of 50 or 75 percent of the cost of the exploration, depending upon the mineral being sought. Funds for the Government's share of the cost of exploration are allocated from the borrowing authority of the Defense Production Act of 1950, as amended. If, in the opinion of the Government, the project has been successful in finding ore, a certification of discovery or development is issued, and the contribution to the project made by the Government is repayable on a percentage-royalty basis on the net sales receipts from any ore produced from the property on which the exploratory work was performed.

Based upon sound engineering and geological principles, exploration projects are agreed upon by the Government and the mine operators under contracts calling for specific work to be performed within specified costs.

The program is administered by DMEA with a small Washington staff and five field auditors. Technical field services are provided through the cooperation of the Geological Survey and the Bureau of Mines. Participation by private industry in the program is widespread and includes individuals, partnerships, and corporate enterprises. The program appeals especially to small mine operators, as evidenced by the large number participating.

During the fiscal year 1955, 472 applications for Government aid in exploration projects were received. The total number of applications received since the beginning of the program in mid-1951 to June 30, 1955, was 2,693 and included requests from 41 States and Alaska. In the 12-month period ending June 30, 1955, 120 contracts were executed by DMEA, bringing the total number of contracts executed since the inception of the program to 767. These contracts represent exploration projects in 32 States and Alaska, and include 28 commodities. At the beginning of the fiscal year 1955, the number of contracts in force was 249, but dropped to 208 at the end of the fiscal year. From the start of the program to date, a total of 60 contracts have been cancelled without any work having been done on the projects. Government commitments on contracts executed during the past 12 months amounted to $3,083,815, and now total $22,454,915. The total estimated cost of the projects covered by the 120 contracts executed in the past 12 months, including the participation of industry, was $5,077,136 and for the 767 contracts executed since the start of the program aggregated $36,894,860.

Sixty-nine certifications of discovery or development of deposits of strategic and critical minerals were issued by DMEA during the fiscal year 1955. The total project cost of these 69 certifications amounted to $3,343,973. The Government was committed to participate to the extent of $2,116,018 on these projects, but only $1,559,144 was actually expended by the Government. The total number of projects certified by DMEA as of June 30, 1955, was 201, having an aggregate project cost of $9,138,706. Participation by the Government in these projects was set at $5,703,081. However, the Government has contributed only $4,394,059 to date, inasmuch as work on some of the terminated projects was completed at less cost than anticipated and several of the other contracts are still in operation. At the end of the fiscal year 1955, the Government had received repayments from 206 operators amounting to $963,122. This sum included repayments from 15 operators for the full amounts of the Government's participation in their projects.

The 201 certifications were on projects involving a search for antimony, asbestos, beryl, cobalt, columbium, copper, corundum, fluorspar, iron, lead, manganese, mercury, mica, monazite, nickel, rutile, sulfur, talc, tantalum, tin, thorium, tungsten, uranium, and zinc. Thirty-eight of the certified projects were in North Carolina; 28 in Colorado; 19 each in Idaho and Utah; 12 in Arizona; 10 each in California, Montana, and Nevada; 9 in Wisconsin; 8 in Washington; 7 in South Dakota; 3 each in Alabama, Alaska, Georgia, Illinois, and New Mexico; 2 each in Arkansas, Missouri, and Vermont; and 1 each in Florida, Iowa, Maine, New Hampshire, New Jersey, Oregon, South

Carolina, Texas, Virginia, and Wyoming. Fifteen of the two hundred and one certified projects had not been completed as of June 30, 1955. On a conservative basis, at prices in effect at the end of the fiscal year, the recoverable minerals and metals in the ores found on the 201 certified projects is estimated to have a gross value of approximately $216 million. Substantial ore showings, which may lead to certification, have been disclosed on 60 other projects.

During the fiscal year 1955, 82 contracts, under which actual work was performed, were terminated without certification of discovery or development. The cost of these 82 projects was originally estimated at $2,359,261, with Government participation set at $1,423,178; but the actual cost to the Government was only $1,058,620.

Three hundred and fifteen contracts with a total project cost of $7,743,037 had been terminated without certification at the end of the fiscal year. The Government's share in the cost of these contracts was estimated at $4,956,968, of which only $3,009,177 was expended. Although a few of these terminated projects have found small quantities of ore, the mineralization was not sufficient to justify their being certified. However, valuable geological information was obtained from all of the these terminated projects.

Every application for an exploration project requires a study by technical experts. In the majority of cases on-site field examinations of the projosed projects are made by DMEA field teams, comprising personnel of the Geological Survey and the Bureau of Mines. Based upon the field work, a project either is approved and a contract made or the application is denied. A total of 1,206 applications have been denied—198 in the past fiscal year; and a total of 477 applications have been withdrawn—but only 64 in the past 12 months.

The number of applications received during the fiscal year 1955 increased approximately 38 percent over the number received in the previous 12-month period. This increase was primarily attributed to the marked increase in the number of applications received for uranium exploration. Substantial increases in the number of applications received for lead-zinc and mercury projects also were made, as well as smaller increases in the number received for fluorspar and mica. These increases reflect in a large degree the intense interest in uranium and the improved market conditions for other minerals.

During the fiscal year 1955 the Contract Administration and Audit Division of DMEA made rapid progress in auditing contract and ore production records. As of June 30, 1955, a total of 650 audits (covering Government disbursements of $9,803,492) on 554 projects had been made. Of these, 175 audits were made of projects covering Government disbursements of $2,616,542, during the past fiscal year. This Division has completed audits of approximately 77 percent of the exploration program disbursements. In addition, 92 audits have been made on 72 projects for production purposes during the past 12 months.

In view of the increased number of applications received and resulting contracts made during the past fiscal year, DMEA increased its staff by approximately 6 percent. The Geological Survey and the Bureau of Mines made equivalent increases in their personnel assigned to DMEA work.

The DMEA issued two amendments to DMEA Order 1, amended, during the fiscal year 1955. Under date of January 12, 1955, amendment No. 1 was issued to provide for reorganization of DMEA field regions to conform with the newly established Bureau of Mines regional pattern. On March 21, 1955, amendment No. 2 was issued to change the addresses of the DMEA field offices in the new regions II and IV. The significant effect of amendment No. 2 was to move the DMEA executive officer responsible for California and Nevada from San Francisco to Reno. This change has greatly facilitated the administration of the program in that area. The DMEA also revised the consent to lien and subordination agreement forms required from owners of leased properties and mortgagors of properties that are subject to exploration contracts. These changes strengthened the administration of the program.

Although some projects are in recess status, principally to permit the operators to improve their financial positions, the number of such recessed projects is being reduced by operators restarting their projects, or, in instances where it appears unlikely that they will be able to restart within a reasonable time, by terminating the contracts.

The spendid cooperation of other Government agencies and the extensive participation of mine operators have aided materially in making the program a success. Particularly significant is the number of small operators participating in the program. Approximately one-half of the DMEA contracts call for total expenditures of $24,000 or less and about one-third of the contracts provide for expenditures of less than $3,000 of the operator's own funds. Substantial quantities of strategic and critical minerals have been found; and although current production, principally of ore removed during the course of the exploration work, is small, the ultimate production from successful projects will undoubtedly be important in the national economy and national defense. On some projects, currently uneconomical deposits have been found, which may be brought into production in times of emergency. These deposits constitute a reserve of strategic and critical minerals which is an important element in the Nation's mobilization base.

OFFICE OF MINERALS MOBILIZATION

Spencer S. Shannon, *Director*

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ON January 6, 1955, the Secretary of the Interior established the Office of Minerals Mobilization and vested it with responsibility for carrying out the Department's mobilization functions for solid fuels and metals and minerals, except for domestic minerals exploration.

The solid fuels functions of the Office were essentially those which had been delegated by the Secretary of the Interior to the Bureau of Mines on July 1, 1954, upon the termination of the Defense Solid Fuels Administration. The functions of the Office relating to metals and minerals included those which had been delegated to the Secretary of the Interior by the Office of Defense Mobilization on November 12, 1954, although they do not include the processing of requests for accelerated tax amortization, loans, guarantees, and procurement contracts and similar operations which the Secretary had delegated to the General Services Administration on December 22, 1954.

The Director of the Office of Minerals Mobilization was appointed on May 4, 1955, and funds appropriated for the Office were to become available on July 1, 1955.

During the fiscal year, the Department's principal mobilization activities in solid fuels were devoted to attaining adequate capacity for metallurgical coal and coke. Industry applications for rapid tax amortization of production facilities were analyzed and recommendations submitted to the Office of Defense Mobilization. Coal requirements and mine capacity in Alaska received attention. A project involving reevaluation of the open expansion goals in solid fuels was initiated.

Initial emphasis in metals and minerals was on several urgent commodity problems which required prompt decision. Some of these problems involved full-scale mobilization supply-requirements analyses and broad recommendations designed to increase supply; others required a reevaluation of expansion goals or research programs; some involved recommendations on proposed government contracts.

In addition, the Office participated in policy and program developments under consideration by the Office of Defense Mobilization, in review of proposed legislation, and in mobilization exercises and activities, including Operation Alert—1955.

Emphasis was placed on organizing the Office and recruiting staff. Administrative arrangements were made with the Bureau of Mines and the Geological Survey to undertake the collection, analysis and evaluation of the technical and statistical data required by the Office.

Plans were prepared for the establishment of industry advisory committees to work with the Office in developing commodity programs and measures to assure continuity of production during emergencies.

OFFICE OF GEOGRAPHY

Meredith F. Burrill, *Director*

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THE Office of Geography was established to carry out the research and other staff functions relating to the standardization of geographic names assigned to the Secretary of the Interior by the act of July 25, 1947.

The work of the Office in 1955 was mainly concerned with areas outside the continental United States. Geographic and linguistic research led to the standardization of some 200,000 geographic names for use by Federal agencies. More than 300,000 tabulating cards were punched for subsequent publication of gazetteers and about 450,000 names on maps and in texts prepared in various agencies were edited for correctness of spelling and accuracy of application. In addition, over 10,000 standard names or information about them were supplied to inquiries by telephone and mail, and research briefs were prepared for over 1,200 formal decisions.

The files now contain well over 1,000,000 names officially standardized by the Board and cross-referenced variant names. These files are substantial for nearly all foreign land areas of the world, and an increasing proportion of the work of the Office is concerned with the maintenance and supplementation of existing files, although they still do not contain all the names needed for maps on the largest scales. Domestic name standardization remained virtually at a standstill in the absence of funds for that activity.

UNITED STATES BOARD ON GEOGRAPHIC NAMES

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THE Board on Geographic Names is an interdepartmental organization established by statute for the purpose of standardizing geographic nomenclature for use by the Federal Government. Its members represent the Departments of State, Army, Navy, Post Office, Interior, Agriculture, Commerce, and Air Force, and the Government Printing Office, the Library of Congress, and the Central Intelligence Agency. Dr. H. Thompson Straw, Department of the Air Force, was Chairman during the fiscal year 1955.

The Board and its committees met frequently to act on names, policies, publications, and related matters. Basic policies were formulated for new areas, and existing policies were extended and amended. The volume of activity is reflected in the Office of Geography report.

Four gazetteers of officially standardized names were issued for public sale by the Superintendent of Documents: No. 1, *British East Africa* (Kenya, Tanganyika, Uganda, and Zanzibar); No. 2, *Madagascar, Réunion, and the Comoro Islands;* No. 3, *Jordan;* and No. 4, *Bolivia.* The gazetteer of Jordan is the first publication available to the public containing standard names rendered in the Board's official system for transcribing Arabic and represents many hours of work by the Board's Advisory Committee on Arabic and Persian. This gazetteer series will cover the world, except the continental United States, at the rate of 10 to 15 volumes a year.

OFFICE OF THE ASSISTANT SECRETARY FOR PUBLIC LAND MANAGEMENT

Orme Lewis, *Assistant Secretary*

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THE Assistant Secretary for Public Land Management exercised secretarial direction and supervision over the Bureau of Land Management, the Bureau of Indian Affairs, the National Park Service, the Fish and Wildlife Service and the Office of Territories.

The area administered by those five bureaus embraces more than 500 million acres of public lands in the United States, Alaska, the insular areas and the farflung Trust Territory of the Pacific Islands. Within this vast area lies the bulk of the Nation's undeveloped natural resources—its national parks and monuments; its refuges for wildlife; and multitudes of pioneering people.

In the year just past, each of the five bureaus achieved significant gains in newly broadened programs designed to promote efficient service to the public and effective conservation and development of our natural resources.

Of equal importance, was the development of forward-looking programs which assure even greater accomplishments in the year ahead.

The National Park Service, for instance, was directed to start planning a 10-year program of development and improvement to provide facilities for 80 million visitors by 1966—the golden anniversary of the establishment of the Service. Meanwhile, the Park Service, supported by congressional approval of more realistic annual budgets, made a good start toward reversing the long cycle of neglect which started with the outbreak of World War II. For the first time in many years a substantial increase in park personnel was possible and a far-reaching program of road and trail improvement could be undertaken.

The Bureau of Land Management was greatly strengthened by legislation implementing the three-point program of resource conservation and development advocated by the Department. With this new and urgently needed authority the Bureau now is in a position to control surface use of mining claims and prevent many of the abuses of the past. At the same time, legitimate mining activities are afforded rewarding opportunities to locate and develop the underground resources the Nation must have to support its growth. Millions of acres of lands withdrawn for powersite purposes are now open to exploration under adequate conservation safeguards. Development of metal and oil and gas resources can now proceed contemporaneously on the same tract under provisions of the Multiple Mineral Development Act.

The revitalized public lands program, under which old withdrawals of public domain areas are reviewed in the light of current conditions, continued to yield substantial returns. Over 2 million acres of withdrawn lands were restored to the unreserved public domain last year. Additional millions of acres are being studied with a view toward their eventual restoration. Simplified and easily understood rules for opening restored lands to public entry were put into effect.

A further step toward more efficient land management was taken when plans were prepared for the first significant modernization of the antiquated lands record system which has been in use since before the establishment of the General Land Office in 1912.

The Bureau of Indian Affairs made praiseworthy progress in its program directed toward improving the social and economic levels of Indian citizens while consolidating its own operations into more manageable and efficient units.

Outstanding was revitalization of an educational program which for the first time promises to virtually wipe out illiteracy among the younger Indian population. By fall 1955, facilities will be available to offer schooling to virtually all school-age Indian children. A dramatic example of the accomplishments in this program is provided on the Navajo Reservation. Only 2 years ago 50 percent of the school-age Navajo children were being denied an education because school facilities were not available for them. At the beginning of the 1955 fall term facilities will be available for all Navajo children.

At the close of the fiscal year, the Bureau accomplished the transfer of its entire Indian health program to the United States Public Health Service. This represented the biggest reduction of program responsibilities in the history of the Bureau, and offers wider opportunities for improvement of Indian health.

Substantial progress was made in programs to relieve advanced Indian tribes of their wardship status and place them in a position to assume full responsibility for management of their own affairs.

Continued advances have been made by the Fish and Wildlife Service for the protection and development of the important resources entrusted to its care. Cooperation between other Federal agencies and State and private conservation organizations was strengthened. Wildlife refuge areas were extended. Study and development of ocean fisheries were greatly bolstered by new programs made possible under the Saltonstall-Kennedy Act.

In Territorial areas, the Office of Territories continued to provide increasing opportunities for Territorial peoples to participate in representative government. Considerable disappointment, however, stemmed from the delays in securing final action on legislation for Hawaiian statehood and to advance the day when Alaska can enter the Union as a State. Programs to improve economic opportunities in the Territorial areas were broadened by legislation approved by the Congress.

BUREAU OF INDIAN AFFAIRS

Glenn L. Emmons, *Commissioner*

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THE year was marked by two main developments: (1) Further progress in reducing the Bureau's program responsibilities to more manageable proportions, and (2) the greatest strides ever made by the Bureau in a single year toward its long-term goal of educational opportunities for all Indian children.

Under the first heading a tremendous forward step was taken on August 5, 1954, when legislation providing for transfer of the entire Indian health program to the United States Public Health Service was approved as Public Law 568 of the 83d Congress. Since the law established July 1, 1955, as the effective date of the transfer, a period of nearly 11 months was provided for working out details. During that time, staff members of the Bureau's Branch of Health and Administrative Division were in almost daily consultation with comparable officials of the USPHS on the innumerable questions of budget, personnel, property, and policy or regulations that were involved in the shift.

The transfer was carried out on schedule at the close of the fiscal year and represented unquestionably the biggest reduction of program responsibilities in the history of the Bureau. It included approximately 3,600 employees and a real property inventory valued at close to $40,000,000. Among the 970 widely scattered buildings involved were 56 hospitals in 13 States and Alaska, 21 health centers, and 13 boarding school infirmaries.

Another major step toward the narrowing of Bureau responsibilities was the enactment of six laws in the 1954 congressional session providing for orderly termination of Federal property trusteeship and special services in specific tribal jurisdictions. One of these, covering the Menominee Tribe of Wisconsin, became law toward the end of the fiscal year 1954. The other five—all approved in August 1954—involved two jurisdictions in Oregon (Klamath and western Oregon), two in Utah (four small Paiute Bands and the mixed-blood population of the Uintah and Ouray Reservation), and one in Texas (the Alabama-Coushattas).

The period of time allowed in these laws for completion of the termination process was indefinite for the Alabama-Coushattas, 2 years from the date of enactment for western Oregon and the Paiute Bands, 4 years from enactment for Klamath, until December 31, 1958, for Menominees, and 7 years from enactment for the people involved at Uintah and Ouray.

In fiscal 1955, good progress was made toward the meeting of these deadlines. Under most but not all of the laws, one of the first requirements was the compilation of an official tribal roll listing the names of all individuals entitled to an ownership interest in the tribal holdings. In each case where such a roll was required, the Indians were given the option of preparing the original roll themselves or having the job done for them by the Bureau. There was also a provision for appeals from the original roll and for final decision by the Secretary. At all jurisdictions where such rolls were required, the original compilation was completed prior to the end of the fiscal year. In only one case, Klamath, was it necessary for the Bureau to take on the compilation responsibility. This need arose after a roll submitted by the tribe was subsequently repudiated and withdrawn by the tribal enrollment committee.

All of the termination laws except the one covering the Alabama-Coushattas also authorized the initiation of special education and training programs for tribal members in need of such assistance to prepare them for the responsibilities they would have to assume after termination. Using an appropriation of $1 million especially provided for this purpose, the Bureau made arrangements during the fiscal year with the State departments of education in Wisconsin and Oregon and with the University of Utah for carrying on such programs at all five of the affected tribal jurisdictions. The programs which were established included not only training in the English language and citizenship responsibilities conducted on the reservation but also off-reservation enrollment of qualified tribal members in selected trade or vocational schools.

The law covering the Alabama-Coushattas was different from all others since it provided not strictly for a termination of trusteeship over tribal property but rather for a transfer of the trust responsibilities from the Federal Government to the State of Texas. Although the Bureau was ready to complete the transfer in December, the action was postponed at the request of the Governor of Texas until the end of the fiscal year so the State could receive full-year compensation under a contract with the Bureau covering the public school education of Indian children. The transfer became effective by secretarial proclamation on July 1, 1955.

Substantial progress was also made during the year in transferring to the States the responsibilities for agricultural extension and home demonstration work among the Indian people. Under authority provided by the Johnson-O'Malley Act of 1936, the Bureau completed contract arrangements for the provision of such assistance by the States extension services in 11 of the 18 States where it has been conducting an extension program. Similar contracts were pending in three other States at the end of the period.

Apart from these various steps leading toward a dimunition of Bureau responsibilities, the most important development of the year was a major broadening of educational opportunities for Indian children. This took place principally in the Navajo jurisdiction where nearly half of the school-age population of 27,106 was not enrolled in any school as recently as the close of the academic year 1953. Under the Navajo emergency education program, which moved into full swing in the fall of 1954, the total enrollment of Navajo children in Federal, public, and mission schools both on and off the reservation was stepped up from a level of 16,215 at the beginning of the fiscal year to 23,679 at the close. This left a balance of 5,011 unenrolled Navajos in the school-age bracket including a substantial number who were married or too old to begin school or could not feasibly attend for some other reason. Plans were developed, however, to make schooling available for all Navajo children who could attend in the fall of 1955.

NAVAJO-HOPI REHABILITATION

In its fifth year of operation, the Navajo-Hopi long-range rehabilitation program authorized by the act of April 19, 1950, produced numerous additional basic improvements for the benefit of the two aribal groups in such fields as education, conservation and survey of resources, irrigation, and road improvement.

Education

Particular emphasis was placed in fiscal 1955 on the educational phases of the program. As part of the Navajo emergency education program, construction of a new 536-pupil school on the reservation at Kayenta was started and 10 additional projects involving expansion or remodeling of existing school facilities on the reservation were undertaken.

The emergency education program required the use of dining rooms and dormitory living rooms for classroom purposes at many locations, while in some instances dormitory living rooms functioned as classrooms by day and as sleeping quarters by night. The off-reservation boarding schools absorbed 1,200 additional students over the enrollment for the preceding year, and Haskell Institute at Lawrence, Kans., accepted a quota of special-program Navajo students for the first time.

In addition to more intensive use of existing reservation school facilities and expansion of the off-reservation program, 37 trailer schools were installed at strategic locations on the Navajo Reservation where regional population density made regular attendance feasible on a day basis. The trailer schools consists of one or more quonset huts to serve as classrooms and kitchen, and trailers which function as washroom and quarters. At many trailer school locations, development of water and access roads was necessary.

Although the 37 trailer schools had an enrollment capacity of 1,119, the average daily attendance at the close of the school year was 712.7. At some locations, the trailer schools did not prove to be feasible, and were discontinued. In other instances, a relatively low average daily attendance resulted because of lateness in completing the installation, lateness in the return of families employed off the reservation, and problems attendant upon children walking to school during the winter.

Reservation and off-reservation boarding school facilities were augmented through arrangements with six public school districts in communities located peripherally to the reservation. Through these arrangements, 1,030 Navajo children were taken into the public schools and housed in dormitories rented from private owners or constructed and operated by the Bureau. The number of Navajo students enrolled in such schools was kept sufficiently small so that they did not dominate the social pattern, on the premise that they would thus make greater use of English and be more rapidly acculturated. At two of the peripheral dormitories, the children were fed by private operators under contract arrangements.

In addition to Bureau schools and the peripheral town program, the public and parochial schools generally were highly cooperative in promoting universal education for the Navajos. Enrollment in both types of schools increased during the year. Two new public schools, constructed with funds appropriated under Public Law 815, 81st Congress, were completed on the reservation at Fort Defiance and Ganado, Ariz. At the former, 440 children were enrolled during the school year. Although the Ganado school plant was not completed early enough for use during the school year, a combined enrollment of 1,040 children at the two schools was expected in the fall of 1955.

The following tables provide statistical information with regard to the Navajo educational program:

TABLE 1.—*Summary of Navajo schools by type, enrollment, and attendance*

Type of school	Number of type	Enrollment	ADA [1]
Boarding	28	6, 414	5, 536. 9
Community boarding	23	1, 575	1, 368. 0
Day	10	622	493. 8
Trailer (day)	37	1, 119	712. 7
Peripheral dormitories	6	1, 030	953. 9
Hogan school (day)	12	313	231. 7
Literacy units (day) [2]	6	108	52. 8
Total	112	11, 181	9, 349. 8

[1] Average daily attendance.

[2] Primarily an adult program. However, in this report only children 6 through 18 are counted.

TABLE 2.—*Summary of Navajo schools by classes and enrollment*

Navajo Agency, Bureau of Indian Affairs	11, 181
Other BIA (off-reservation)	6, 882
Public (State)	3, 900
Mission (parochial)	1, 408
College and other non-BIA schools	308
Total	23, 679

TABLE 3.—*Summary of enrollment and average daily attendance at the peripheral dormitory school operations*

Name of location	Enrollment	ADA	Name of location	Enrollment	ADA
Aztec, N. Mex	116	109. 4	Snowflake, Ariz	120	110. 6
Gallup, N. Mex	341	298. 2	Winslow, Ariz	198	190. 1
Holbrook, Ariz	129	121. 7	Richfield, Utah	126	123. 9

While construction costs of the emergency education program were met from long-range program funds, the cost of operating the 51 reservation boarding and community schools, the 6 bordertown dormitories, 10 reservation day schools, 37 trailer schools, 13 hogan schools, 6 literacy field units, and that of transporting over 6,800 children to the off-reservation boarding schools was charged to the regularly appropriated funds. The latter totaled $8,461,165 in fiscal year 1955, and the Navajo Agency Branch of Education maintained a staff of 1,465 employees to operate the Bureau school program.

Funds requested for the fiscal year 1956 were based on census data and reflect the anticipated enrollment in the school year 1955–56, as summarized in the following table:

TABLE 4.—*Summary of anticipated enrollment in the school year 1955–56*

Type of school	1954–55 authorized (enrollment fiscal year 1955)	1955–56 enrollment anticipated by branch of education fiscal year 1955
Reservation BIA boarding schools	7, 267	7, 316
Community BIA boarding schools	1, 406	1, 575
Day schools	[1] 544	[2] 394
Hogan schools	[3] 373	[3] 350
Trailer schools	[4] 1, 188	[5] 1, 000
Peripheral or bordertown dormitories	960	1, 295
Total	11, 738	11, 930

[1] 21 units. [2] 13 units. [3] 14 units. [4] 47 units. [5] 40 units.

Health

Because of the transfer of the health operations of the Bureau to the Public Health Service, effective July 1, 1955, there was no appropriation of long-range funds for hospital and health facilities in fiscal year 1955.

Construction of the Tuba City Hospital, however, was completed during the year, and construction of housing in conjunction with the hospital began, under contract, in December 1954.

Actually, the amount of money authorized in the Long-Range Act was insufficient to carry out the total program intended, and circumstances have changed to some degree since the congressional authorization. This is especially true in connection with the treatment of tuberculosis. With the advent of the antituberculosis drugs, the construction of sanitorium facilities on the reservation or in Albuquerque is no longer necessary. It has been possible to contract for beds and medical care with nine off-reservation, privately operated sanatoria, and at the close of the fiscal year there were 480 Navajo patients in those institutions.

In addition, 100 patients were under care at the Tuberculosis Sanatorium operated by the Bureau of Indian Affairs at Fort Defiance, bringing the total to 580.

Irrigation

Work completed on the Hogback project during the year includes: (*a*) Construction of 8.9 miles of main canal with a capacity of 300 cubic feet per second; (*b*) the San Juan River siphon, 1.84 miles in length, with a capacity of 40 cubic feet per second; and (*c*) the placing of 2.8 miles of prefabricated canal lining.

Also in 1955, work moved forward on construction of the main canal and the subjugation of land on the Red Lake project. The main canals, distribution systems and structures to serve 900 acres of newly subjugated land were completed, the farms were assigned and were under cultivation at the close of the period. On the 300 additional acres planned for the project, subjugation was only partially complete.

Roads and Trails

The Long-Range Act authorized the construction of 636 miles of primary and 633 miles of secondary roads on the Navajo and Hopi Reservations. These mileages were considered the minimum necessary to serve schools and hospitals, and to open the reservation areas for development and trade.

In fiscal year 1955, work was completed on 33.029 miles of grade construction, 6.648 miles of base or gravel surface, 15.287 miles of bituminous surface, and 208 linear feet of bridge construction. This brought the cumulative totals under these several headings up to 162.268, 131.629, 48.260, and 996.

Soil and Moisture Conservation and Range Improvement

Conservation work carried forward under the long-range program in fiscal 1955 included 718 educational meetings with a total attendance of 13,866, new plans for over 1,000,000 acres, detailed soil surveys on almost 40,000 acres, and installation of a wide variety of practices such as contouring, check dams, cover crops, deep plowing, strip cropping, and rough tillage.

Range Water Development

Contracts were let in four districts for the drilling of 25 wells, all of which were completed, although one produced no water. In addition, contracts were let for the drilling of 21 wells with money available in the tribal appropriation. Two of these were completed by the end of the year.

PROGRAM DEVELOPMENT

One of the Bureau's most important functions during the fiscal year was to assist the tribal groups covered by termination laws in preparing for the eventual cutoff of Federal trusteeship and special services. In this connection, Bureau personnel consulted and cooperated not only with Indian groups but with State and county officials and other agencies or individuals directly concerned. In most instances, the transition requires the transfer of one or more Bureau functions to a State or local unit of government.

Since some provisions of the acts are pioneer approaches to the solution of difficult problems, differences of opinion arose here and there about their interpretation or the best procedures to follow. Most of these differences, however, were resolved by conferences of interested parties and the preliminary work leading to termination at each jurisdiction moved forward just about on schedule. The progress of each group is summarized briefly below:

The Menominees of Wisconsin on June 17, 1954, under Public Law 399, became the first group of Indians for which a bill to terminate Federal supervision over their property and affairs was enacted. The period allowed for adjustment was approximately 4 years or until

December 31, 1958. Steps taken to date include: (1) Establishment of a tribal roll, (2) distribution of per capita payments of certain funds on deposit in the Treasury of the United States with special measures taken to protect the interests of minors, (3) arrangements with the State for a special adult education program and for the transfer of education and other services to the State, (4) clarification of Bureau and tribal responsibilities under the act, and (5) the establishment of Agency offices and personnel at a site separate from those of the tribal council. This last step was taken in order to differentiate clearly between the functions and responsibilities of the tribal council and those of the Bureau during the transition period. Some of the principal remaining problems of the Menominees are those related to the management or disposition of tribal resources and enterprises and to integration with the State and county governments.

Public Law 627, approved August 23, 1954, for the Alabama and Coushatta Tribe of Texas, provided for transferring Federal trusteeship for approximately 3,100 acres of timbered tribal land to the State of Texas. This transfer, completed in less than a year, was comparatively easy because of the fact that Bureau responsibility had for a number of years been limited primarily to land trusteeship and to contract payments to the State for education of Indian children. Although Federal trusteeship responsibilities have terminated, these Indians, if they desire, will continue to be admitted to hospitals and schools maintained by the United States on the same terms as other Indians.

The Klamath Indians of Oregon under Public Law 587, approved August 13, 1954, were given 4 years to complete the transition. Their problems relate primarily to the disposition or management of tribal resources, principally timber and land. Most of the responsibility for education and other services have been carried for a number of years past by the State and local units of government. The following steps were accomplished during the fiscal year: A proposed tribal roll was submitted; payment of $250 per capita, as required by the act, was made; a contract was entered into with the State of Oregon for a program of education and training; three management specialists were selected to assist the tribe in the management of property and in the distribution of property among adult members who may wish to withdraw their assets from the tribe; and a tribal committee was elected by referendum to represent the tribe in consultations with the management specialists.

Public Law 671 for the Uintah and Ouray Indians of Utah was approved August 27, 1954. The act contains three main features: (1) Partition and distribution of assets between mixedblood and fullblood members; (2) termination of Federal trusteeship and supervision over the property and affairs of the mixedblood group within a period of 7 years, with the opportunity for fullbloods to consider themselves as mixedbloods; and (3) a development program for the remaining fullblood group designed to assist in making them self-supporting and eventually able to dispense with Federal supervision over their affairs. Numerous consultations were held during the year by Bureau representatives with tribal members of both groups and satisfactory progress was achieved along several lines. Proposed rolls were compiled and submitted; numerous applications for transfer from fullblood to mixedblood group were received; plans for distribution of assets of the mixedblood group were prepared and submitted for review; and a preliminary draft of the fullblood long-range program was also prepared and submitted for review.

Public Law 762 for four bands of Paiute Indians of Utah was approved September 1, 1954, and provided a transition period of 2 years. During fiscal 1955, a proposed tribal roll was submitted, arrangements were made with the State University for a special program of education and training, and plans were developed for the distribution of tribal property to individual tribal members.

Public Law 588 for western Oregon Indians was approved August 13, 1954, and 2 years were allowed for the transition period. There are 60 tribes, bands, and groups included. Only two tribes—the Confederated Grande Ronde and the Confederated Siletz Tribes—owned tribal property and were required to submit tribal rolls. The proposed rolls were submitted. Arrangements were also made with the State for a special program of education and training for adult tribal members.

HEALTH ACTIVITIES

While the level of health among the Indian populations does not yet approach that enjoyed by most Americans, significant improvements in health services to these peoples were achieved by the Indian Bureau during its final year of direct administration of the Indian health program. The curative medical care program was expanded, and public health and preventive health services were intensified. These improvements were made in spite of such continuing obstacles as geographic and psychological isolation of many of the Indians concerned, shortages of medical and other health personnel, and limitations in facilities which control the extent of the services that can be rendered.

Tuberculosis continued to be the most frequent cause of severe illness and disability, followed by diarrhea and enteritis among infants and young children. Significantly, half of all deaths among Indians are caused by diseases that can be prevented—tuberculosis, pneumonia, influenza, and the two infant diseases already mentioned. Slightly less than half of the Indian deaths are caused by conditions which yield to modern public health measures—common communicable diseases, such as respiratory infections, and injuries.

Medical and Hospital Care

At the beginning of the year, the Bureau's Branch of Health was operating 58 hospitals for Indians, with a total of 2,840 beds. Two hospitals—one in New Mexico and one in Colorado—were closed during the year. Contractual arrangements with larger and better equipped hospitals more than offset the reduction in the number of beds due to the closing of these facilities, and will make better service available in the areas concerned.

Of the 56 hospitals in operation at the end of the year, 48 are within the continental limits of the United States, and 8 are in Alaska. There are 2,800 beds in these facilities, including 1,400 general, 1,325 tuberculosis, and 75 orthopedic. Outpatient treatments rendered through these hospitals approximated 520,800.

A substantial part of the patient care made available by the Bureau was provided through contractual arrangements with hospitals operated under State, county, community, or other non-Federal auspices. The average daily patient load in contract facilities during the fiscal year consisted of 165 general patients, 970 tuberculosis patients, and 240 psychiatric patients. The total cost of this care for the year amounted to approximately $5.75 million.

A contract with Cornell University, under which the university supplied a surgeon and a chest specialist for the Fort Defiance Hospital, Navajo Agency, was put into effect. These two specialists provided training for physicians in various hospitals in the area by having the physicians assigned for brief periods to the Fort Defiance Hospital on a rotating basis.

Although the acute shortage of nurses continued—especially in the more remote locations—the number of nurses on duty in the Indian health program was increased during the year. This increase was made possible by reclassification of some of the positions which raised the salaries that can be paid. Anticipated improvements in housing in the remote areas were expected to alleviate the present shortage still further.

Highly qualified nurses for administrative positions in some of the larger hospitals were brought into the program during the year, and in-service training was increased to develop others for greater responsibilities.

The practical nurse school was transferred from Lawton, Okla., to Albuquerque, N. Mex., where more clinical facilities are available for student experience. Plans were completed to use the Albuquerque Indian Sanitarium, the Santa Fe Indian Hospital, the Bureau Public Health Nursing Units, and the Navajo Medical Center for these students. Plans were approved for converting the old general hospital into a building which will house the school and provide living quarters for the students.

Tuberculosis Control

The situation with respect to the problem of tuberculosis among the Indian population improved during the year. Chemotherapy and surgery, as indicated, have done much to improve the mortality rate. Indeed, if the Indian tuberculosis patient is found early enough and if he accepts treatments, his chances for recovery are as good as those of the non-Indian.

B. C. G. vaccination is being continued on 75 to 80 percent of all newborn infants in the 26 participating Indian hospitals. The extent to which this is a factor in improving control of the disease can be better appraised if a survey can be made in several Indian schools to determine vaccination results over a 5-year period. Such a survey has been recommended.

Except in the Phoenix and Albuquerque areas, tuberculosis case-finding is being carried on by the States concerned. The mobile X-ray survey among the Hopi Indians, in which 95 percent of the recipients of treatment for tuberculosis participated, was completed recently and is being compiled. Preliminary results of the study indicates that few cases require hospitalization for active tuberculosis.

The State of Montana completed an intensive 2-year X-ray survey which, when compilation is completed, will reveal the extent of the tuberculosis problem in that State. Surveys are in process in South Dakota and Wyoming.

Public Health and Preventive Services

The program to reduce the incidence of enteric and filth-borne diseases among the Indians was strengthened and extended during the year. With the help of native sanitarian aides recruited and trained during the perceding year, intensive environmental surveys of Indian communities were instituted. These surveys were, where possible, correlated with available morbidity and mortality data for the Indian population in the areas concerned.

Concurrently, under the guidance of the area sanitary engineers, the sanitarian aides worked with tribal councils, health committees, and individual families to encourage and assist in the development of safe water supplies, proper method for disposal of human wastes and garbage, and control of insect vectors of disease.

A significant number of tribal councils responded favorably to the cooperative approach of the sanitarian aides and added their efforts to bring about improved standards of sanitation. Some of them allocated tribal funds for sanitation improvements on a community-wide basis.

Public health education work also continued to play an important part in the Bureau's disease-prevention activities. In fiscal 1955, full-time health educational activities carried out under qualified health educators were extended to two additional areas. In addition, plans for the use of Indian community workers who have received health training were put into effect on key reservations. These workers will assist in teaching measures for improving health and preventing illness.

The last fiscal year saw the inauguration of medical social services in the Health Branch on a program basis. Recruiting of medical social workers was begun, and 12 were appointed with 10 more in the process of being selected as the year ended. These medical social workers will provide direct casework services in 8 hospitals. They will concentrate on helping patients to adust to hospital requirements and to plan for discharge and for vocational rehabilitation. They also will aid those patients who develop concern over problems relating to their illness.

EDUCATION

Approximately 113,000 Indian children of school age (6–18 years) attended public, Federal, mission, and vocational schools in the United States and Alaska in fiscal year 1955. More than half, 54.9 percent, were in public schools, 35.9 percent in Federal schools, and 9.2 percent in mission and other schools. Although enrollment in all types of schools was larger than in any previous fiscal year, the greatest increase took place in Federal schools because of the Navajo emergency education program. Percentagewise, therefore, enrollment in public schools was a somewhat smaller proportion of the total enrollment than in the previous year.

Contracts with States and local school districts under the Johnson-O'Malley Act of 1936 were negotiated in 20 States and the Territory of Alaska, providing Federal financial assistance for the public school education of more than 36,000 Indian children. In line with broad Bureau policy, the operation of Indian schools established by the Federal Government is being transferred to State and local jurisdictions wherever feasible. Public schools absorbed an additional 2,300 Indian students in fiscal year 1955.

The Bureau continued operating 86 boarding and 260 day schools in fiscal 1955. Many of the reservation boarding schools accommodate large enrollments of day pupils. The day schools included 14 instructional aid schools in Alaska, and 53 special units (37 trailer, 12 hogan, and 4 literary) on the Navajo Reservation. Classes were also conducted for Indian children who are patients in four sanatoria, and Indian students were housed in Federal dormitories at 10 locations to attend public schools.

Approximately 83 percent of students enrolled in Federal schools were fullblood Indians and only about 3.4 percent were less than halfblood.

Navajo Emergency Education Program

This program, more fully described in an earlier section of this report, was initiated following the completion of a survey of educational needs on the Navajo Reservation in 1953. At that time, an emergency plan was developed which had as its goal the enrollment of 22,000 Navajo children in school by the fall term of 1954. As a result of special appropriations provided by Congress and close cooperation with State officials and the Navajo Indians, the Bureau not only reached but actually exceeded its goal. In summary, based on figures available at the time of the survey at the end of 1953 through to the end of the fiscal year 1955, a total of 8,914 additional children were enrolled in school. The following table shows the progress of the program by years.

	1953		1954			1955		
	6 to 18	Under 6 over 18	6 to 18	Under 6 over 18	Total increase	6 to 18	Under 6 over 18	Total increase
Enumerated	27, 106		27, 362			27, 752		
Enrolled	14, 106	659	15, 501	714	1, 450	22, 741	938	7, 464
Not enrolled	13, 000		11, 861			5, 011		

Plans were developed during the fiscal year for enrolling the remaining out-of-school group during the 1955 fall term. When this has been accomplished, the program will be aimed at relieving the overcrowding of approximately 2,000 pupils in present Bureau schools and providing for the anticipated annual increase in school population.

Other Educational Activities

Counseling and careful placement of Indian youth in private industry continued to receive special emphasis and to produce favorable results. In fact, some schools were unable to meet the demand for their graduates.

An evaluation team composed of four professional education employees in cooperation with school staffs evaluated several school establishments as to the programs, purposes, and needs. The team technique proved effective in focusing attention on standards in each activity and on specific planning for improvement.

While information was not available from all areas, reports received by the Bureau indicate that 21 tribal organizations have programs for assisting their youth through loans or scholarships for higher education. Montana, South Dakota, and Oklahoma have passed legislation establishing special tuition scholarships for Indian students of their respective States. In addition to funds set up by State legislatures, other sources such as youth-serving organizations of national scope, foundations, and others have increased scholarship opportunities for Indians as a result of the need presented and the cooperation offered by the Bureau.

The Bureau made grants in fiscal 1955 to 101 students attending 34 institutions of higher learning in 14 States and the Territory of Alaska.

Two areas still deserving special attention in regard to educational facilities are the State of Mississippi and the Territory of Alaska. At the Choctaw Agency in Mississippi, where the Bureau operates 8 day schools for Indian children, the facilities are far from adequate to permit the enrollment of all school-age children and have been extremely overcrowded. In fiscal 1955, a special survey was conducted of the total educational needs at Choctaw both with respect to the adequacy of facilities and the type of program offered. Based on this survey, a long-range school construction program was developed to help provide for the children out of school because of the lack of facilities and to relieve overcrowding in the existing facilities, many of which are old and in substandard condition. Under this program, four additional classrooms were provided in fiscal 1955 for use in the next school year. During the 1955–56 school year, it is anticipated that four more classrooms will be added.

In Alaska, during the year, the Bureau operated two boarding schools, 70 day schools, and 14 instructional aid schools. It also provided instruction for native children in the Mount Edgecumbe Orthopedic Hospital. In instructional aid schools, children are given instruction by local citizens in such temporary facilities as may be available. Where the population is sufficiently stabilized and enrollment justifies it, an effort is made to replace the instructional aid units with regular school facilities. Enrollment in all Bureau schools in Alaska totaled 4,897 in 1955. It was estimated that there were approximately 1,129 children, age 6 to 18, out of school during this period because of the lack of facilities. This number is believed to be made up largely of small numbers living in isolated and almost inaccessible localities.

WELFARE

In the welfare field, increased emphasis was placed during the year on social services related more specifically toward strengthening family life and helping Indian people to improve their standard of living and to acquire self-sufficiency and independence in managing their own affairs. While assistance to needy Indians remains a basic activity of the Bureau's welfare program, there has been a growing demand for social services focused on the broader objective of preventing dependency and family disintegration and on helping Indian people to establish their legal status in matters of marriage, divorce, adoption, as well as custody and guardianship of children and adults. In the case of tribes covered by terminal legislation, this type of counseling and service is especially important to assure that children and others needing assistance will secure the protection of person and property necessary before final termination of the Secretary's trust responsibility.

Engaged in this work during the past year were 47 social workers operating in 29 of the 46 local jurisdictions of the Bureau, directed by 9 area social workers with the assistance of 5 area child welfare workers.

General Assistance

The number of cases in the Bureau's general assistance program for needy reservation Indians, who are ineligible for public assistance under the social security program, showed little change during the year. There was, however, a slight increase in the total amount of payments since individual grants were somewhat larger to reflect current living expenses.

Less need for assistance in the Northern Plains States due to a favorable, mild winter was offset by increased requests in the Southwest caused by the severe, prolonged drought, and in Alaska by the declining salmon run. During the fiscal year 1955, the general assistance caseload averaged 2,603 families and 6,799 persons monthly.

Tribal Programs

Several Indian tribes take responsibility for their own welfare programs, showing concern particularly for the old people in their groups. These programs usually include provision for general assistance to the needy tribal members. In fiscal 1955, an increasing number of tribes became interested in the surplus food commodity program and assumed responsibility for distribution to the needy families.

Three tribal groups—Jicarilla Apache, Ute Mountain, and Southern Ute—entered into agreements with commercial banks authorized in trust management under the laws of their respective States to hold in trust and to manage the money of members of the tribes who are minors. These trust funds are established from distributions of pro rata shares of tribal collections of income from oil and gas resources.

Child Welfare

Review of the cases of children referred to Bureau boarding schools for social reasons was continued and resulted in arrangements for many of the children to remain with their own families and attend public school. On a selective basis, children without suitable homes were placed under foster care and, in some instances, better foster placements were made despite the difficulty in finding families who are willing to undertake the care of children not their own. Social workers in all areas also worked on plans for the summer care of children attending boarding schools who have no home or relatives to whom they can go during school vacation.

Contracts with the States of Minnesota, Wisconsin, and Nevada for foster care of Indian children were continued, and State legislative action made possible a limited contract with South Dakota.

Expanding health programs in Alaska and on the Navajo Reservation, together with the Navajo emergency education program, materially increased the requests for child welfare services. In addition, greater need for child welfare services was found in Montana and North Dakota due to Supreme Court decisions in both States leaving Indians outside the application of State civil law and directly affecting matters of custody and guardianship of children and facilities for their care in boarding homes and institutions.

RELOCATION

During the 1955 fiscal year, 3,461 Indians were assisted to relocate under the Bureau's voluntary relocation program. This included 2,656 persons in 708 family groups and 805 unattached men and women. The total number of relocations represents a 60-percent increase over the 2,163 reported for the previous fiscal year.

Of the 3,461 who were assisted to relocate, financial assistance to cover all or part of the costs of transportation to the place of relocation and short-term temporary subsistence at destination was provided to 2,415 Indians (including 2,033 persons in 488 family groups and 382 unattached men and women), in addition to all other relocation services. The remainder of 1,046 (comprising 623 persons in 120 family groups and 423 unattached men and women) financed themselves but received full guidance services including assistance in obtaining employment and housing at the point of relocation.

On the reservations, there was a marked and active interest in relocation throughout the year. Available relocation assistance funds were insufficient to serve all persons who were determined to be in need and who requested relocation services. At the end of the year, a sizable backlog of applications was on hand and awaiting the availability of fiscal year 1956 funds.

During the year, field relocation office staffs were in contact with over 3,500 employers. Indians placed in various jobs earned average beginning hourly wages of $1.62 for men and $1.07 for women. Vital statistics among the people relocating in fiscal 1955 showed 808 school-age children relocating with their families, 96 births, and 8 deaths.

On December 27, 1954, the Branch of Relocation was assigned the responsibility for development and activation of a program of relocation combined with vocational training for members of tribes covered by enacted terminal legislation.

Contacts were made with a representative number of training institutions, and the new relocation and vocational training program was explained to them. Without exception, they indicated interest and a desire to cooperate. Agency relocation officers were assigned in Utah and Oregon, and applications were received in sufficient time so that on March 1, 1955, the first trainees and members of their families were relocated to destination points. Throughout the last third of the fiscal year, the agency relocation officers took a total of 170 applications. Of these, 113 were accepted and plans for relocation and vocational training were completed. Trainees were enrolled in 33 different courses.

LAW AND ORDER

In the field of law and order, the Bureau continued its negotiations seeking the extension of State law to Indian reservations. The act of August 15, 1953 (Public Law 280, 83d Cong.), which had excepted from State jurisdiction the Menominee Reservation in Wisconsin, was amended at the request of the Menominee Tribe to accomplish the extension of State jurisdiction to that reservation. The legislature of the State of Nevada enacted a statute pursuant to Public Law 280 for the purpose of assuming jurisdiction by the State over the Indian country therein. This statute was to become effective 90 days after July 1, 1955. The statute contains provisions whereby any county which does not wish to assume jurisdiction may be relieved of that responsibility by proclamation of the Governor. At the end of the fiscal year, no such proclamation had been issued by the Governor.

Amendments were proposed in the Congress to Public Law 280 which would require Indian consent before the extension of State jurisdiction to any Indian reservation. The Department, however, recommended an amendment which would require consultation rather than consent. Prospects for enactment of either type of amendment at the 1955 congressional session appeared rather slim at the close of the fiscal year.

Proposals were made in the legislature of Idaho and Washington which would have provided for amendment of the constitutions of those States to enable them to acquire jurisdiction over Indian country as provided in Public Law 280. However, the proposals were dropped by the legislatures because of objections by the Indian people.

The act of May 31, 1946 (60 Stat. 229), conferred criminal jurisdiction on the State of North Dakota over the Devils Lake Reservation. However, in February of 1955, the Supreme Court of North Dakota handed down a decision holding that the purported transfer of jurisdiction was ineffective and that the State did not acquire any jurisdiction over the Devils Lake Reservation. It, therefore, became necessary for the Bureau to reassume the burden of law enforcement on the Devils Lake Reservation.

During the year, six Indian tribes adopted resolutions pursuant to the act of August 15, 1953 (Public Law 277, 83d Cong.), for the purpose of legalizing intoxicants within the reservation. This brought to 28 the total number of Indian tribal groups which have acted to exercise the local option afforded Indian groups by the provisions of the statute. Although the Indians have generally welcomed removal of discriminatory legislation outside of Indian country, they have shown a marked tendency to move slowly in the legalization of intoxicants within their reservations.

TRIBAL AFFAIRS

During the fiscal year, a new Branch of Tribal Affairs was formed in the Bureau's Washington office and placed in the Division of Community Services. The Branch took on certain functions previously performed by the coordinating staff relating to self-government, including chiefly advice and assistance to Indian tribes in connection with the development and operation of tribal business and tribal government organizations. Most of the Indian tribes operate under some form of constitution and bylaws recognized by the Department.

Many are organized as well as incorporated under the Indian Reorganization Act, the Oklahoma Indian Welfare Act, and the Alaska Act.

In fiscal 1955, many such groups found it necessary to amend their organization documents in order to bring them more in harmony with their growing activities and responsibilities, or with other changing conditions. For example, the native village of Mekoryuk in the Territory of Alaska, which consists of a group of Eskimos having a common bond of residence, enlarged its organization to include all eligible natives residing on the Nunivak Island.

Per Capita Payments

On March 13, 1953, the Assistant Secretary of the Interior stated his belief that payments of current tribal income should be made by Indian tribes on a pro rata basis to the individual tribal members with due regularity where such payments are consistent with the point of safety and the protection of the tribe as a whole. In accordance with this policy, more than $10,084,300 was distributed through per capita payments to approximately 42,495 tribal members. The per capita shares ranged from $50 to $500 and four of the tribes—Uintah and Ouray, Klamath, Southern Ute, and Ute Mountain—made more than one per capita distribution during the year.

Tribal Enrollment

With the enactment of terminal legislation, the preparation of tribal membership rolls and the determination of the status of enrollees and applicants in the affected tribes became a matter of considerable importance. Generally, the legislation provided for the closing of the membership rolls as of midnight of the date of enactment and provided for preparation of a proposed roll of members of the particular tribe concerned within a specified time. If not done within that time, the Secretary was required to prepare the membership roll. The legislation required that the roll be published in the Federal Register, and thereafter, persons claiming membership in the tribe, or an interest in tribal assets, had a specified time within which to appeal to the Secretary protesting the omission from or inclusion on the roll of the name of any person. Rolls of this character were published for the Ute Indians of the Uintah and Ouray Reservation in Utah, for four scattered bands of Paiute in Utah, the Klamaths of Oregon, and the Grand Ronde Tribes of Oregon.

Legislation enacted in the 83d Congress required the Secretary to complete by June 30, 1955, the revision of the roll of the Indians of

California, which imposed a heavy burden on the Department in view of the large number of applications which had been filed. Amended regulations had to be issued, and approximately 2,000 appeals from the decision of the area director at Sacramento had to be considered by the Bureau's Washington office, with a second appeal in a number of cases to be determined by the Solicitor of the Department, acting for the Secretary. All appeals were disposed of by the June 30 deadline.

REALTY TRANSACTIONS

Over 26,000 Indian land transactions were processed during the year. Included in this total are 12,186 surface leases and 3,128 mineral leases. There were 2,594 transactions which resulted in removal of 521,771 acres from Bureau jurisdiction in response to requests from the Indian owners. This was accomplished by 1,741 sales to non-Indians and by the issuance of a total of 853 patents in fee, removals of restrictions, and certificates of competency, which transferred to the Indian applicants the responsibility for management of their trust and restricted properties. Eighty-seven tracts of land covering 10,165 acres were purchased from non-Indians for tribes and individuals.

In addition, there were 1,704 transactions completed which had no material effect on the overall acreage of land in trust or restricted status. These included sales between individual Indians, exchanges between individual Indians, sales from individuals to tribes, exchanges between individuals and tribes and conveyances of title as gifts.

The real estate sections of the Indian Affairs Manual and corresponding portions of the Code of Federal Regulations covering patents in fee, certificates of competency, removal of restrictions, and sale of allotted and purchased lands and related forms were revised during the year in order to simplify procedures, permit a wider latitude of action by the individual, and more closely aline the Bureau's real estate activities with accepted commercial practices. New appraisal procedures were also adopted so that the Bureau may more effectively carry out its trust responsibilities.

As of June 30, 1955, field offices of the Bureau reported an uncompleted workload or backlog of 13,213 Indian requests or applications for various types of realty transactions. Included in this total are 1,010 requests for patents in fee, 5,681 requests for supervised sales, 593 proposed exchanges of various kinds, 154 proposed partitions, 395 requests for removal of restrictions, 126 applications for certificates of competency (which, in effect, remove the lands owned by the applicant from trust status), 1,475 proposed surface leases, 703 proposed mineral leases, 392 rights-of-way actions, and 2,477 probate inventories and postings.

Mineral Leasing

Discovery of oil in the Williston Basin (which includes considerable Indian land in Montana and the Dakotas) in 1951 set off one of the greatest oil booms of recent years. The lease play (preceded by large-scale geophysical exploration) and deep test drilling necessary to prove the field, show the desirable results that can be obtained where there is competitive judgment and free investing. Not only is this true of the Williston Basin but also other areas in which there has been large-scale exploration during the past 5 years.

Not so many years ago, it was felt that operations on the Osage Reservation in Oklahoma had passed their peak. Today, however, increased interest in oil and gas operations on this reservation is an outstanding feature of the midcontinent field. During the past 5 years, the total income from bonus rentals and royalties at Osage has risen from slightly in excess of $4,000,0000 to approximately $9,500,000.

In the southwest region, there is every indication of future record development and extension of the gasfields. A number of gas and oil wells have been brought in and the market for the gas appears assured by commencement of construction work on a pipeline from the San Juan Basin to the Pacific Northwest.

During the year, 2,997 oil and gas leases on Indian land were approved.

In the field of minerals other than oil and gas, the search for uranium is of top interest. The large number of prospectors and miners searching for uranium has presented a number of administrative problems. With a view to assisting in meeting the Nation's needs for uranium and at the same time protecting the rights of the Indians, a special procedure has been set up for the issuance of short-term prospecting permits on definitely described tracts with a right to a lease on a limited acreage.

The greatest interest centers in the Navajo Reservation, N. Mex. and Ariz., and the Pueblos in New Mexico, Wind River Reservation, Wyo., and the Spokane Reservation, Wash. The deposits in these areas are of economic importance. There is, however, widespread interest in prospecting for uranium on other Indian reservations.

The phosphate deposits on the Fort Hall Reservation, Idaho, are being explored steadily. The improvement in the lead and zinc market has proved beneficial in bringing additional royalties to the Indians of the Quapaw Reservation, Okla.

The total revenue received by Indians from bonuses, rents, and royalties on oil and gas and other mining leases during the year was more than $29 million.

IRRIGATION

The irrigation program for the fiscal year 1955 included studies and investigation for the development and utilization of land and water resources on Indian reservations; the protection and establishment of Indian water rights; construction, extension, and rehabilitation of existing and authorized Indian irrigation projects; the study and review of operation and maintenance assessment rates on a number of projects with a view to placing the projects on a self-sustaining basis; negotiations with landowners and water users to work out plans to take over operation and maintenance work; and regular routine operation and maintenance of projects.

The determination of water rights and the construction of adequate and proper irrigation facilities for all irrigable lands on Indian reservations are the responsibilities of the Federal Government and are necessary prior to the termination of Federal trusteeship so that as many as possible of the Indian families living on reservations can obtain a sustaining economy. To this end, irrigation development work has progressed as rapidly as funds would permit.

During the fiscal year, approximately 8,300 acres of new lands were provided with irrigation facilities and by the rehabilitation of irrigation facilities approximately 10,500 acres of land were provided with a stable and supplementary water supply. The work involved drilling and equipping of 14 new wells, the rehabilitation of 35 old wells, the construction of approximately 42 miles of canals and laterals, the replacement and construction of approximately 97 various types of water control structures and the installation of approximately 77,300 feet of steel and concrete pipeline. In addition to the foregoing irrigation development work, 31 miles of power distribution lines were extended to serve an additional 218 customers on the Colorado River, Flathead, and San Carlos projects. Crops produced on the various projects during the calendar year 1954 were valued at $50,239,000.

The more important irrigation developments during the fiscal year 1955 were on the following projects:

Colorado River project, Arizona.—During the fiscal year 1955, the work on this project included the subjugation of 2,000 acres and the construction of incidental minor structures (nearing completion); construction of 4 miles of drains; the drilling and equipping of one drainage well; and the extension of the power distribution system to provide electrical energy for 15 new customers.

No additional colonists were brought in during the fiscal year 1955 because of the indefinite status of the land tenure.

San Carlos project, Gila River Indian Reservation, Arizona.—The extreme drought conditions experienced on this project over the past several years were continued during the 1954 irrigation season. Out of a total of 100,000 acres under constructed facilities, only 45,980 acres were cropped in calendar 1954 because of the water shortage. The underground water continued to drop at an alarming rate, causing an increase in the use of electrical energy for project pumping.

The work on this project included the drilling of four new wells; replacing and lowering pump bowls in 24 wells; lowering of pump bowls in 12 wells, and the enlarging and extension of the power system to service an additional 124 customers.

California.—The work throughout the State consisted primarily of the development of water supplies for irrigation and domestic purposes on the various and scattered reservations and rancherias. The irrigation and domestic water systems on the San Manuel Reservation, Auburn, Cedarville, Laytonville, Point Arena, Robinson, Guideville, and Rohnerville Rancherias were completed and turned over to the Indians who have assumed responsibility for their operation and maintenance.

Blackfeet project, Montana.—The work on this project was the continuation of the enlargement and rehabilitation of the main canal and distribution system to provide for the delivery of a firm water supply to 21,500 acres, an increase of approximately 10,500 acres.

Flathead project, Montana.—The work on this project included the extension and rehabilitation of the irrigation distribution system to serve an additional 800 acres and the extension of the power distribution system approximately 17 miles to service additional 79 customers.

RANGE MANAGEMENT

The major problems in range management during the past year were centered in the Southwest and were of particular importance on the Navajo, United Pueblos, Fort Apache, and San Carlos jurisdictions. Continuing heavy grazing pressures accompanied by prolonged drought were largely resonsible for these problems. Elsewhere, however, forage utilization on Indian lands generally has been in accord with the principles of conservation. Of the 44 million acres of Indian rangeland with a rated grazing capacity of approximately 880,000 cow-units, slightly more than 33 million acres with a capacity of about 559,000 cow-units were used by Indian livestock operators. The total use value of the grazing privileges would include approximately $2,900,000 actually collected in cash fees and an estimated

$3,500,000 worth of free privileges granted to Indian operators. About 80 percent of the cash collections for grazing privileges were made in Montana and South Dakota and slightly more than 70 percent of the free-use value was made available in Arizona and New Mexico.

The estimated value in the take in fish and wildlife resources is in excess of $2,000,000.

SOIL AND MOISTURE CONSERVATION

In fiscal 1955, operators of 12,000 Indian farms and ranches comprising 26,705,959 acres participated in 221 soil conservation district programs. Many Indians are members of district boards of supervisors and take an active part in the direction of community conservation plans and work. Many Indian conservation enterprises have been formed to expedite application of works on the ground. The Navajo Tribal Council voted $70,000 of tribal funds to assist in conservation work during the year. The Fort Apache Council voted $60,000 and many other tribal groups came in with lesser amounts. Additional tribes begin contributions each year.

Many Indian allotments on irrigation projects have either been idle or beneficial use has not been made of the land or available water because the land had not been leveled or put into a condition to use water effectively. The land was waterlogged, alkaline, or otherwise unsuited for irrigation. The additional soil technicians made available during the year gave particular attention to the survey of such lands, and preparation of recommendations for remedial treatment. In following out these recommendations, 9,759 acres were leveled, 11,488 acres were drained, and alkali conditions were corrected on 12,069 acres bringing lands so treated into a high state of production. Lands unfit for profitable irrigation were removed from projects on the basis of these surveys and recommendations. In addition, work was accomplished on 1,067 pounds, 41,739 acres of waterspreading, 95,649 acres of reseeding, 65,065 acres of brush eradication, and attendant conservation practices. Introduction of these measures, to which the Indians contribued more than the Government, is controlling erosion, reducing flash floods and utilizing the floodwater for the production of forage and water for livestock. Livestock distribution is being improved, grazing capacity increased, and use of range facilitated by these works.

FORESTRY

About 518 million board-feet of Indian-owned timber, with a stumpage value in excess of $8,500,000, were cut under contract or used by

Indian tribal sawmills during the calendar year 1954. An additional 130 million board-feet were cut by Indians and non-Indians for local use. As in previous years, the greatest concentration of timber sale activity was in the Pacific Northwest. The Indian forests in California, the Southwestern States, the Lake States, and Montana also contributed substantial volumes of timber to the forest products industries of their regions.

For many years the Indian Bureau has recognized the need of more dependable information regarding the quantity and quality of Indian forest resources. Recently, some tribes have made their own funds available to pay for forest inventories in order to provide this needed information. The first of these inventories to be completed was on the Navajo Reservation in the late fall of 1952. A forest management plan was prepared on the basis of this newly acquired information in April 1953 which reveals that a substantial increase in annual cut can be made without violating sustained-yield management principles. Engineering consultants, paid from tribal funds, are now engaged in a study to determine the desirable extent and direction of expansion of timber harvesting activities.

Similar aerial and ground surveys were completed during the past year on the Hoopa Valley and Tule River Reservations in California and on the San Carlos Reservation in Arizona. Forest management plans for these reservations are in preparation.

The three tribal sawmill enterprises—on the Menominee Reservation in Wisconsin, the Red Lake Reservation in Minnesota, and the Navajo Reservation in Arizona—have continued to operate successfully, doing a combined business in excess of $3 million annually. In addition to providing a profitable outlet for forest products of the reservations, these mills provide employment opportunities for tribal members.

During the 1954 calendar year, 868 forest fires occurred on 39,439 acres of Indian forest and range land, or about 0.07 percent of the 58 million acres (including over 9 million acres of intermingled non-Indian land), requiring protection. The cost of suppression of these fires exceeded $120,000. The number of fires for that year was 65 less than the average number for the preceding 4 years, and the suppression costs were $62,000 less than the average for the same period. The timber, forage, and other values destroyed in calendar 1954 are estimated to be about $160,000. Suppression costs and amount of damage were well within the acceptable limits for the year.

Less dramatic than the forest fires, but even more destructive, were the depredations by forest insects and disease. Bark beetles exacted a heavy toll from several reservation forests particularly on the Yakima Reservation in Washington, the Warm Springs Reservation in Oregon, and to a lesser extent on the Navajo Reservation in Arizona and the Cherokee Reservation in North Carolina. Direct action against bark beetle epidemics through sanitation-salvage logging operations was undertaken on several of the reservations and a modest amount of direct control work was performed.

The principal forest diseases against which effective action was taken were the white pine blister rust, in the Lake States, and the dwarf mistletoe on the Mescalero Reservation in New Mexico.

EXTENSION ACTIVITIES

As indicated earlier, responsibility for extension work among Indians was taken over during the year, under contract arrangements, in 11 of the 18 States where the Bureau has had an extension program. Greater emphasis was also placed on the education phases of the Bureau's extension program and on bringing Bureau methods and procedures more in line with those used by the State extension services. In this connection, the Bureau adopted for the use of its extension workers, in the respective States in which they are workers, the same forms for building Indian extension programs and reporting the work as the State extension workers used in making their programs and reporting their work. The change in the use of forms is helping and simplifying the transfer of the Bureau's extension work to the various States.

In calendar 1954, Bureau extension workers made 48,601 farm and home visits, received 53,490 office calls and held or participated in 3,916 meetings for adults with an attendance of 165,380.

In promoting crop improvement work, extension agents assisted some 20,000 individuals to adopt better farm practices with reference to improved varieties, soil culture, use of fertilizers, planting, harvesting, irrigating, control of injurious insects and plant diseases and better farm planning.

Livestock production, especially beef cattle, is the Indians' largest single agricultural enterprise. The progress Indians have made in the improvement of their livestock has been outstanding and has contributed very greatly to their agricultural income. Extension workers assisted approximately 21,000 farmers and stockmen during the year in the improvement of their livestock production and management practices, such as selection and breeding, feeding, marketing, control of livestock diseases and parasites, and the use of more efficient business methods.

Home Extension Work

Bureau home agents gave assistance to families in the construction or remodeling of 851 homes; in providing household furnishings for

802; in selection, use and care of home equipment for 1,092; in providing water and/or sewage systems for 579. In planning and producing the home food supply, assistance was given to 2,180 families, and 3,710 were assisted with meal planning preparation, preservation and storage of food, with special emphasis on child feeding. Clothing construction work was done with 7,414 families and 3,413 were aided in selection, buying, and mending of clothing. Safety, first aid, and sanitation practices were conducted with 2,729 families. Family and community recreation and development were stressed.

4–H Club Work

During 1955, Bureau Extension personnel sponsored 289 4–H Clubs with a membership of 3,450 enrolled in projects approved by the respective States. Bureau agents reported 395 members having health examinations because of participation in the extension program. Indian youths participated in fairs, tours, county and State contests with 378 attending a 4–H Club camp and 369 engaging in community activities.

ROADS

The Federal-Aid Highway Act of 1954 provided contract authorization in the amount of $10,000,000 for construction and maintenance of Indian reservation roads and bridges for each of the fiscal years 1955, 1956, and 1957. The authorization made it possible to speed up construction work on most reservations and also to develop realistic long-range plans of operations and to integrate those plans with the long-range plans of the local governments.

The road construction program on the Navajo and Hopi Reservations amounted to $2,592,000 for the construction of part of the system of roads authorized by the Navajo-Hopi Rehabilitation Act. The Bureau total road construction program consisted of $7,956,672 allotted to 9 areas serving 24 States. Two hundred and sixty-four miles of reservation road were graded and drained; 349 miles were surfaced; and 950 running feet of bridges were constructed. One hundred and seventy-two miles of road were constructed and removed from the Indian Bureau system under agreements with counties whereby the Bureau agreed to construct the roads according to a specified standard and the counties agreed to include the constructed mileage in their local highway systems and to assume full maintenance responsibility.

The Bureau's road maintenance program in fiscal 1955 included surface maintenance, snow removal, flood damage repairs, and repairs to bridges on 18,446 miles of Bureau roads.

CREDIT ACTIVITIES

The Bureau continues to maintain a credit program for the benefit of those Indians who are unable, because of lack of acceptable collateral or for some other reason, to obtain financing from the same sources as other citizens. At the same time, however, Indians are being increasingly encouraged to seek their needed financing from these normal sources and Bureau credit employees actively assist them in doing so.

Since many Indians now deal directly with lenders without benefit of Bureau assistance, full information on the amount of financing received by Indians from non-Bureau sources is not readily available. However, incomplete data indicate that the amount of financing they receive through regular commercial channels is steadily increasing and that dependence on the Bureau for financing is thus being reduced. The following tabulation shows available data for recent years:

	Financing from commercial sources (calendar year)	Additional loans by the United States (fiscal year)
1952	$22, 316, 000	$2, 463, 836
1953	27, 665, 000	1, 075, 755
1954	33, 959, 000	453, 322

The Bureau's credit program is conducted mainly with two funds—tribal moneys and a revolving loan fund appropriated by the Congress. Tribes with funds available are required to use their own moneys to supply credit to their members. Tribes that do not have funds available, or whose funds are insufficient to take care of the credit needs of their members, may receive loans from the United States.

At the close of the 1954 fiscal year, the amount of tribal funds being used for credit purposes exceeded the amount of loans outstanding by the United States for the first time in the history of the Bureau's credit program.

	Tribal funds used for credit purposes	Revolving loan funds borrowed from the United States
1952	$8. 537, 445	$11, 335, 261
1953	9, 704, 611	10, 190, 941
1954	9. 669, 468	9, 505, 193

In 1952, Indians were using for credit purposes about 75 cents of tribal funds for every dollar borrowed from the United States. By 1953, the amount had increased to 95 cents for every dollar, and by 1954 to $1.02.

Revolving Loan Fund

Through the 1954 fiscal year, $13,799,600 had been appropriated for the revolving loan fund out of authorizations totaling $17 million. No additional appropriations were made in either 1954 or 1955. Of the amount appropriated, $12,550,768 was available for loans. Repayments of principal and interest payments on loans are credited to the fund, and are available for further loans. A further source of revenue to the fund is cash received from livestock sales and settlements pursuant to the act of May 24, 1950 (25 U. S. C. 443).

The following tabulation summarizes operations under the revolving loan fund through the fiscal year 1954:

Receipts:		
Appropriation available for loans		$12,550,768
Interest paid		915,954
Cash settlements for cattle		1,341,232
Repayments on lonas		13,586,132
Total		28,394,086
Expenditures:		
Total loans made		23,114,070
Cash balance June 30, 1954		5,280,016
Loans receiveable:		
Total loans made June 30, 1953	$22,660,748	
Additional loans 1954	453,322	
Total loans made		23,114,070
Less:		
Payments made to June 30, 1953	12,464,169	
Additional payments 1954	1,121,963	
Total payments		13,586,132
Cancelled to June 30, 1953	5,582	
Additional cancellations 1954	17,163	
		22,745
Loans receivable June 30, 1954		9,505,193

The collectibility of some of the outstanding loans is questionable. Loans in Alaska accounted for $4,432,521 or about 47 percent of the unpaid balance, and this record was largely attributable to recent poor fishing seasons in southeast Alaska. Four Alaskan villages that received loans for the acquisition and operation of salmon canneries suffered substantial losses in 1953. They were indebted for loans totaling $3,589,122 as of June 30, 1954. Only one village has any equity remaining in its cannery. The other three villages have sizable deficiencies, and the loans made by the United States to them are endangered. It was necessary to restrict activities of these canneries during 1954 because of the critical condition of the outstanding loans. An unpaid balance of $237,717 also remained on loans made to five other villages in southeast Alaska, on which substantial losses may be suffered. The remaining $605,682 owed on loans made in Alaska was, in the main, collectible.

A reserve of $1,105, 575 was established for loans of doubtful collectibility as of June 30, 1954. The revolving loan fund had a deficiency of $173,553.

Use of Funds by Tribal Organizations

Loans of revolving funds by the United States to Indian tribal organizations, and tribal funds advanced to such organizations for credit purposes, are used to finance tribal enterprises, and to make loans to individual members and cooperative associations of members. Repayments of principal and interest collected on such loans are available for further loans within the terms of the organizations' agreements with the United States.

The following table shows the total credit operations of tribal organizations and the volume of business during 1954:

	Advances to enterprises	Loans to co-operatives	Loans to individuals	Total
Loaned or advanced to June 30, 1953	$16, 183, 415	$1, 344, 813	$27, 477, 229	$45, 005, 457
Additional 1954	336, 853	25, 937	1, 973, 123	2, 335, 913
Total to June 30, 1954	16, 520, 268	1, 370, 750	29, 450, 352	47, 341, 370
Repaid to June 30, 1953	7, 145, 692	1, 181, 264	18, 449, 633	26, 776, 589
Additional 1954	449, 448	26, 132	2, 208, 121	2, 683, 701
Total to June 30, 1954	7, 595, 140	1, 207, 396	20, 657, 754	29, 460, 290
Canceled to June 30, 1953	11, 401	13, 576	166, 375	191, 352
Additional 1954	-------------	13, 128	63, 397	76, 525
Total to June 30, 1954	11, 401	26, 704	229, 772	267, 877
Balance unpaid June 30, 1953	9, 026, 322	149, 974	8, 861, 220	18, 037, 516
Balance unpaid June 30, 1954	8, 913, 727	136, 650	8, 562, 826	17, 613, 203
Decrease	112, 595	13, 324	298, 394	424, 313

Tribal enterprises are operated by organizations for the benefit of all members of the tribe conducting the enterprise. The Alaska salmon canneries, Eskimo trading posts, stores, tourist courts, livestock herds, farms, and land enterprises are examples of the types of enterprises conducted. Cooperative associations differ from tribal enterprises in that membership is restricted to those Indians interested and engaged in a particular activity and does not comprise the whole tribal group. Livestock associations constitute the main type of cooperative undertaking. Generally, the livestock are individually owned, but are operated cooperatively.

There were 5,835 loans to individuals outstanding as of June 30, 1954, a decrease of 454 from the number outstanding the year previous. The repayment record was not satisfactory. Delinquencies increased from 5.20 percent of the amount due at the close of 1953 to 6.35 percent at the close of 1954. Over 33 percent of the total amount delinquent was on loans made in Alaska. Because of the high delinquency rate, it was necessary to restrict the credit activities of some Indian organizations.

BUILDINGS AND UTILITIES

Construction activities of the Bureau in the 1955 fiscal year were primarily concerned with completion of the Navajo emergency education program started in the latter part of the previous fiscal year. These completed facilities provided educational opportunities for an additional 3,384 Indian children. By using economical materials and methods of construction, a saving of $887,334 was made in the "NEEP" program. This saving was reprogramed to provide additional facilities, and this work was well under way at the close of the fiscal year.

A complete new school at Kayenta, Ariz., on the Navajo Reservation, was nearing completion at a cost of $1,086,000. The project includes an 18-classroom school building, two 268-pupil dormitories, dining hall and kitchen facilities, 42 quarters for educational personnel, and utilities for the new plant.

Major educational facilities provided in other areas included a dining hall and quarters at Warm Springs, Oreg., at a cost of $59,500; school building, gymnasium, dining and kitchen facilities and 12 quarters at Neopit, Wis., on the Menominee Reservation at a cost of $257,835 (tribal funds); and a heating system at Keams Canyon, Ariz., on the Hopi Reservation at a cost of $137,980.

In addition to sanitary facilities provided in the Navajo program, sanitary conditions were improved in nine other locations at a cost of $338,292.

One 75-bed hospital was completed at Tuba City, Ariz., on the Navajo Reservation at a construction cost of $680,125. Fifteen quarters were constructed at Tuba City and the old hospital was remodeled to provide 15 additional quarters for hospital personnel, at a cost of

$218,886. The Bureau also remodeled and enlarged the hospital at Keshena, Wis., on the Menominee Reservation, to provide a 34-bed hospital. This project was financed by tribal funds. Health facilities on the Papago Reservation were increased by the construction of a clinic and a quarters building at Sells, Ariz., costing $34,874.

ARTS AND CRAFTS

The Indian Arts and Crafts Board continued to promote the economic welfare of Indian artists and craftsmen through a threefold program focused on educating the Indian craftsmen in modern commercial methods, fostering high-quality Indian products, and protecting both the consumer and the Indian producer from cheaply imitated wares.

While the individualism of the Indian craftsmen has been a major asset in production, it has been of little help in the marketing of their products. Originality of design and execution give Indian arts and handicrafts their charm; but in selling goods, the craftsmen need group action and technical assistance in promotion, production, marketing, and developing their own business organizations.

One of the principal functions of the Indian Arts and Crafts Board has been to encourage the formation of strong Indian-owned and Indian-operated production-sales organizations through which the Indians are taught modern merchandising methods without "commercializing" their products.

In calendar 1954, the Qualla Arts and Crafts Association at Cherokee, N. C., with the Board's assistance, achieved a noteworthy record. By producing only the highest quality and selling exclusively the finest workmanship of the Cherokee craftsmen, this organization had total sales amounting to $35,602.08 for the period. It is sponsored by the board which maintains in residence at Cherokee an arts and crafts specialist who gives firsthand assistance in maintaining standards, in improving production and sales techniques, in promotion, and in organizational matters. With this technical guidance, a State charter was applied for and granted to the organization in 1954, making it a cooperative venture, entirely self-owned and economically independent.

Similarly, the Rosebud Arts and Crafts Association in South Dakota, with the assistance of the board's regional representative, became a State-chartered cooperative. Plans are now under way to activate a similar sales and production organization for the Southern Plains Indians.

The Board through its staff of five regional arts and crafts specialists sponsors 18 organized Indian crafts groups and many hundreds of individuals in the United States and Alaska, providing field assistance to each through the comparatively small staff. Specific areas of operation for the Board include Alaska, the Northern and Southern Plains States, North Carolina, Florida, Mississippi, and the Southwestern States. Total sales of the combined craft groups in calendar 1954 amounted to $451,005.44 as compared with $396,226.32 the preceding year.

Although the Board has accurate records only on sales made within the scope of its operations, it estimates that approximately $6 million worth of Indian arts and crafts altogether were sold in the United States during 1954. This is a substantial economic factor and an indication of the effectiveness of the Board's overall program during the past 17 years to create better public recognition of the work of Indian artists and craftsmen in the United States and Alaska.

PROPERTY AND SUPPLY

The continuing study of Bureau operations that may be in competition with private enterprise resulted during fiscal 1955 in the closing out of more laundries, dairies, telephone and power systems. The services are now obtained commercially.

Fourteen Federal Indian schools were transferred to public school districts, and several others were in process of transfer under the act of June 4, 1953, at the close of the fiscal year.

The job of reevaluating Government quarters occupied by Bureau employees at field installations was completed and new rental rates were established in accordance with directives of the Bureau of the Budget.

A real property inventory was initiated in order to put the records of all federally owned real property in the custody of the Bureau on a current basis. These records, when completed, will provide data for reporting to Congress as well as for administrative use.

BUDGET AND FINANCE

Continued progress was made during 1955 in revising and improving the accounting system installed in bureau accounting offices in fiscal 1953, particularly in the revision of certain operating and other accounts to more adequately meet budgetary and program needs. In order to carry out the work of the Bureau more adequately and efficiently, certain housekeeping functions of the area offices at Anadarko and Muskogee, Okla., were consolidated at Muskogee, resulting in the discontinuance of the Anadarko accounting office. Accounting and related work for the Flathead irrigation project in Montana were transferred from the Billings area office to the Flathead project, and a separate accounting office was established at Albuquerque to perform the accounting and related functions in connection with the construction of specific buildings and utilities projects. In addition, the accounting functions for the Cherokee Agency, North Carolina, were transferred from the Aberdeen area office to the central office to coincide with the responsibility for the Cherokee programs. Studies were continued to further improve, strengthen, and simplify budgetary and accounting requirements.

ORGANIZATIONAL CHANGES

The relocation office of Oakland, Calif., was moved during the year to San Francisco, and two suboffices were established—one at Oakland and one at San Jose. This new arrangement should enable the Bureau to provide better service for Indians relocating in the bay area.

Consolidation of the overall direction of programs and the housekeeping functions of the Red Lake and the Consolidated Chippewa Agencies of Minnesota in a new headquarters at Bemidji was made during the year. It is expected to bring about a substantial saving in operating expenses.

The Cherokee Agency in North Carolina was placed directly under the central office for reporting purposes instead of clearing through the Minneapolis area office. The agency location in relation to the central office in Washington facilitates communication and overall supervision.

The construction of the Fort Randall Reservoir in South Dakota made it necessary to abandon the site where the Crow Creek Agency was located. The agency was moved to the Pierre Indian School at Pierre, S. Dak. The name has been changed to the Pierre Agency.

PERSONNEL

The Bureau established an executive development program designed to provide a fully rounded administrative background to Bureau field and Washington office employees who have demonstrated their ability to assume higher administrative responsibilities and who possess adminitrative potential. Employees included in the program are selected from the substantive program activity functions as well as the general administrative functions and are presently occupying positions at the GS–9 through GS–13 levels. The program is considered by the Civil Service Commission to be one of the broadest and most progressive ever approved by the Commission, covering both administrative and program officials.

BUREAU OF LAND MANAGEMENT

Edward Woozley, *Director*

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PUBLIC LANDS

THE Department's responsibility for stewardship of the public domain has evolved from an 1812 Congressional charge to the General Land Office: "* * * to perform all actions and things touching or respecting the public lands of the United States * * *."

Since 1946 when the General Land Office was consolidated with the Grazing Service, that responsibility has centered in the Bureau of Land Management which administers or participates in administering the vast residue of public domain and certain other lands—an area totaling some 826 million acres in the United States and Alaska.

The Bureau exclusively administers approximately 468 million acres of this total, most of which is unappropriated and unreserved. About 178 million acres lie in the United States, 290 million in Alaska.

In addition the Bureau has secondary responsibilities of varying degree in disposing of the natural resources in another 242 million acres reserved for national forests, national parks, national monuments, wildlife refuges, historic sites, irrigation projects, military or atomic energy use, power sites, and other public purposes; 58 million acres of privately owned lands in which the minerals are reserved to the United States; and 58 million acres of acquired lands—most of which was once part of the more than 1 billion acres that have been disposed of under the numerous public land laws since the founding of the Nation, but which have reverted to Federal ownership through purchase, exchange, transfer, condemnation, or donation.

Functionally, the Bureau of Land Management deals with the natural resources of the public domain. These are the land itself, the range grasses and other forage, the minerals (including oil and gas) and millions of acres of forest and woodland.

With respect to the land, the Bureau surveys, diagrams, plats, registers, transfers, patents, reserves for special purposes, classifies, sells, and leases the public land in multifarious ways—and maintains the vast official record of all such transactions, including more than 6 million patents contained in nearly 12,000 volumes. These records are the original links in the chains of title to real estate actions both private and Federal.

In the production of forage for livestock and wildlife on the Federal range, the Bureau protects, restores, conserves, improves, and leases some 170 million acres of unreserved lands for grazing, browsing, and other purposes.

BLM acts as custodian of minerals in the public domain (including reserved lands), in acquired lands, in 58 million acres of privately owned lands in which the minerals are reserved to the Federal government, and in a recently added new frontier—the submerged lands of the Outer Continental Shelf. The Bureau is responsible for administering the thousands of complex laws governing mining and mineral leasing.

The Bureau of Land Management manages the forests of the public domain and O. and C. reverted lands of western Oregon for maximum sustained yields and sells these yields on a free competitive basis to private industry.

REORGANIZATION COMPLETED

Followthrough on the reorganization which was placed in effect during the previous fiscal year required considerable personnel management activity in redescribing positions, duties and performance standards in the training of supervisors and indoctrination of employees to different supervision, and in new and changed work procedures, in staff shifts to effect improved placements and in adjusting the staff in general to work operations in the changed organizational units.

In general, employee productivity and quality of work was maintained after due allowance for reasonable obstacles inherent in such a reorganization. The leadership ability demonstrated by the principal new crop of management officials, namely State supervisors, was significant during the first full year of operations.

On May 1, 1955, the Bureau installed a promotion plan designed to insure selection of the best available person for a given vacancy. The plan provides for formal consideration of all persons within the Bureau who meet minimum basic qualification standards for the job and, in addition, requires consideration of qualified applicants from outside.

With exception of one area administrator and one State supervisor the management staff of the Bureau remained intact throughout the year.

The sixth annual BLM training conference was held in August at the Tony Grove summer camp of the Utah Agricultural College near Logan, Utah. Forty selected Bureau employees, representatives of the Department, the college, the Congress, the Forest Service and other Government agencies participated in the program.

Five management trainees, representing each area and the Washington, Office, participated in the Department's sixth management training program in Washington.

Employment in the Bureau on June 30 totaled 1,889 distributed as follows: Area 1, 461; Area 2, 554; Area 3, 480; Area 4, 169; Eastern States office, 92; and Washington office, 133.

MANAGEMENT PLANNING

With reorganization of the Bureau essentially completed and issuance of manualized procedural instruction well under way, the urgent necessity for modernizing the Federal Government's public land records was the biggest single improvement problem confronting BLM in fiscal year 1955. The Bureau met it head-on by laying the groundwork for a two-phase modernization program that will be the first innovation in an antiquated records system predating establishment of the General Land Office in 1812.

The first step, planned for completion by the end of fiscal year 1956, calls for the preparation of a control document index at a cost of $400,000, which amount was made available by Congress. The control document index will consist of microfilm copies of patents, orders of withdrawal and restoration, and other essential records mounted on aperture-cut tabulating cards.

The second step calls for the total revision of the basic land records over a 5-year period at an estimated cost of $5 million for the 17 Western States. The second step will be accomplished progressively on a State-by-State basis, and upon completion of the records for a State, the basic land records and the portion of the control documents index pertinent thereto will be completely decentralized to the field office concerned.

Under the new system, the present status record will be replaced by a two-part record developed with modern methods, techniques, and equipment, and using simplified procedures. The first part of the record is a narrative summary, chronologically arranged, of all essential actions and transactions affecting a single township. The second part is a township status plat which will show graphically the ownership status of lands and minerals at a glance.

Benefits to the Bureau, the whole Federal Government, and to all users of the public land records will be fourfold: The official record of the public domain will be complete; lands conveyed, rights granted, and rights retained will be known; determination of land ownership and use status will be simplified; applications of all kinds can be handled more effectively, easily, and economically.

The Bureau also developed a completely new program planning system aimed at providing a more realistic basis for budget making and work accomplishment. Applied for the first time to the work program and proposed budget for fiscal year 1957, the new system establishes an up-the-line responsibility for proposing a program, based on the needs of all operating levels, and a down-the-line allotment of funds based on programs authorized. Besides providing incentive to accomplishment, the new program will afford a supervisory check of progress made with funds authorized.

FINANCE

Revenue from the management of public lands in fiscal year 1955 amounted to $239,548,730. This amount included some $142 million from the initial "sale" of leases on the Outer Continental Shelf and $97 million from public land receipts, an increase of $20 million over the prior fiscal year. Of the total amount, over $38 million was distributed to States and counties. The receipts were from varied sources, principally from oil and gas leasing, timber and land sales and grazing permits and licenses.

The Bureau's appropriation for expenditure in fiscal year 1955 amounted to $15,451,574.

LANDS

The departmental and Bureau program to revoke unnecessary withdrawals of lands reserved for various purposes yielded increased results during the year with restoration of a total of 2,044,000 acres of public land. Approximately 1 million acres of the released lands are in Alaska. Additional millions are now in various stages of processing preparatory to their release. Withdrawals totalled 1,238,000 acres. The major portion of this area (almost 900,000 acres) is accounted for by the Craters of the Moon and Saylor Creek gunnery ranges in Idaho, set aside for the Air Force. Withdrawals of lands within national forests as forest administrative, recreational, and related sites constituted an additional 121,000 acres to the total. Otherwise, withdrawals were held to relatively small areas. Genuine need of the land for public purposes had to be demonstrated in all cases as a criterion for granting any withdrawals.

A simplified format for opening public lands to entry upon revocation of a withdrawal, or otherwise, was approved and put into effect.

The new language informs the public precisely when they may apply under the nonmineral land and under mineral-leasing laws, when they may make mining locations, and at what time their applications will be considered as filed. The form calls for actual dates rather than computation of dates when the various provisions of the order will take effect. The purpose of this is to inform the public specifically as to their rights and to avoid confusion and conflict, particularly in connection with mining claims.

New rules were also issued to insure greater publicity concerning applications for the withdrawal of public lands. In addition to publication of notice of such applications, local press information must be issued, individual notification must be given to those who have a record interest in the lands, and copies of the notice must be posted in the land and district offices of the Bureau and sent to the country recorder, the local post office, courthouse, and other locations generally frequented by the public. These procedures have been adopted to give the interested public full opportunity to be heard in connection with proposed withdrawals.

The Bureau cooperated in the intense search for uranium by expediting action on restoration of lands, wherever feasible, to mining location. This program was not without its problems. An area in the Pumpkin Buttes section of Wyoming, which included 7,520 acres of public lands and 38,920 acres of patented lands where the minerals had been reserved to the United States, was released from an Atomic Energy Commission withdrawal after an earlier revocation had been itself revoked due to the probability that violence might break out at the date set for the making of mining locations on the lands. The second order of opening, which was preceded by considerable publicity, went into effect without indication of adverse results.

As part of the program to cooperate with the States to assist and encourage them to seek satisfaction of their land grants, a number of Executive orders dating back to 1910 withdrawing the leasable mineral deposits in the public lands in Utah were modified to permit the grant made to the State for school purposes to attach.

Efforts to reduce the backlog of pending withdrawals and restorations met with some measure of success during the year. New applications and relinquishments were considerable but these, in the main, were kept current.

Land Adjudication

Land use and disposal applications continued to be received at an accelerated pace. New and reactivated cases were approximately 60 percent higher in number than in the preceding year, which in turn had set a record for the period since World War II.

Chief source of the higher-rate-of-applications experience was the mounting demand for public lands of 5 acres or less under the Small Tract Act. This demand was highest in southern California and southern Nevada where "land locator" or "filing service" operators were extremely active. Small tract base applications were up approximately 50 percent from a year earlier, and applications for small-tract option purchases more than doubled the rate of the preceding year. In addition, a few direct-auction sales of small tracts were held during the year.

Applications for other types of land disposals or permitted uses continued at a fairly steady pace, except for substantial increases in the volume of desert-land applications, State indemnity selections, and public land withdrawals and restorations. Large increases occurred in reactivations of homestead and desert-land entry cases, reflected in final proofs filed by entrymen on entries that had been allowed in increasing numbers in recent years.

The number of land adjudication cases completed during the year nearly doubled the 1954 output and the improvement extended to all types of cases. The unrelenting influx of new work, however, once again defied all efforts to make inroads into the backlog of pending work. This has been the annual experience of the Bureau since the beginning of the Korean conflict.

An important development pertaining to desert-land entries was the issuance of Opinion M–36263 by the Solicitor of the Department of the Interior on February 23, 1955. This opinion held that desert-land applications cannot be allowed and that desert-land entries cannot be patented where the source of water alleged is percolating ground water within the State of Arizona. The reason given was that under the decision of the Arizona Supreme Court in the case of *Bristor* v. *Cheatham* (75 Ariz. 227; 225 P. 2d 173, 1953), percolating waters not comprising an underground stream with well-defined channel and banks and a current are not subject to use under the appropriation doctrine.

Misleading advertising by land-locating agencies, particularly in California and Nevada, unintentionally or otherwise caused numerous individuals during the year to believe that by merely paying a filing fee they automatically gained title to 5 acres of desirable public lands near established communities with excellent opportunity for development, including roads, streets, water, electricity, and schools, and other public services or utilities. The speculative resale value of such tracts was emphasized by some of the locator services. To insure personal knowledge by the applicant of the topography and other features of the land, a regulation was issued on June 28, 1955, effective July 5, 1955, by which personal inspection of the tract applied for, or land within one mile of the tract, was required of all small-tract lease applicants.

Land Classification

The public domain land classification program of the Department has been decentralized to the field offices of the Bureau of Land Management. Land classification pursuant to section 7 of the Taylor Grazing Act or other laws is essential before disposal or occupation of public lands may be made under homestead, desert land, public sale, exchange, or selection applications, and certain other applications. Allowance of applications is discretionary.

Of significance during the year was the issuance by the Director of the Bureau of Land Management, after review by the Office of the Secretary, of policy directives controlling the conditions under which lands will be classified as suitable or not suitable for disposal under the Desert Land Act and State indemnity selections.

The desert-land policy is to encourage development of suitable agricultural lands by private enterprise, consistent with the intent of the Desert Land Act and the Taylor Grazing Act. Development must be based upon a determination as to the highest and best use of the land. Land classified for disposal under the Desert Land Act must be, among other things, more valuable or suitable for the production of agricultural crops under irrigation than for the production of native grasses and forage plants.

The classification policy for State indemnity selections is to give a high priority to the satisfaction of State selection rights. Such selections will be approved unless, in accordance with prescribed criteria, they conflict with applications previously filed, with small-tract or recreational classifications, or with an active Federal management program, or they involve lands necessary to the effective management of other Federal lands.

The conduct of land classification investigations on an area basis as distinguished from individual applications, is one of the Bureau's management improvement projects. The major objective of area classification is economy in operation through the consideration of all land-use factors affecting an entire geographical unit, such as a small subbasin. The overall approach permits assessment of all values and results in obtaining information necessary or action on all types of applications on hand or when received.

Smaller area classification projects are not limited to areas where disposals are being considered under the Small Tract Act. Area classification also applies where groups of tracts can be examined simultaneously pursuant to applications for homesteads, desert land entries, State lieu selections, public sale, or other forms of disposal.

Such projects are also initiated on the Governmen's motion, such as public sale disposal areas or to determine the classification of a range area that has been proposed for reseeding.

Most area classification work of the Bureau, owing to the great influx of applications, is done in response to the demand for land from applicants. In addition, however, the Bureau has continued its participation in the interagency public land inventory and classification program in the Missouri River Basin and completed its classification work in the Arkansas-White-Red River drainage area.

In the Missouri River Basin, a total of 12,501,217 acres of public lands and interspersed patented lands have been classified to date. Of this total 855,328 acres were classified during the current fiscal year. As a result, several land disposal areas have been delineated. A Bureau program of land disposal on its own motion was initiated in South Dakota with the public auction sale in June 1955 of 74 tracts totaling 11,000 acres in Haakon County. Major land pattern adjustments are underway for the simplification of control of lands among Federal and State agencies. Important data for land treatment measures in connection with range improvement and resource conservation are also being obtained.

Land classification studies in the Arkansas-White-Red River Basin resulted in the revocation of a withdrawal of 112,000 acres of principally woodland in Arkansas. The public lands involved are being systematically disposed of at public auction sale.

Area classifications were completed in a number of other instances, allowing decisions to be made on groups of individual applications affected thereby. The following examples indicate the kinds of issues that were involved in typical area classification projects.

On the basis of the Mojave Drainage Report involving 101,280 acres of desert land in Southern California, action was taken on 354 applications for desert-land entry. Of these, 185 applications covering 47,000 acres were found to be suitable for entry and 169 applications covering 54,280 acres were found to be unsuitable and were rejected.

An area of 150,000 acres of vacant public lands in Okanogan, Ferry, and Stevens Counties, Wash., was classified for State lieu selection and 20,000 acres in Benton County, Wash., were classified for disposal by public sale.

In the Amargosa Desert area, Nye County, Nev., 91,000 acres of vacant public lands were examined in connection with 37 pending applications for permits under the act of October 22, 1919.

Thousands of small tract applications have been filed in the vicinity of Las Vegas, Nev. Classification action for small tract uses in this area have been delayed by the attention that necessarily must be given to competing applications for desert-land entries, exchanges, other forms of disposal, including unpatented mining claims. A total of 33,140 acres of land in the Las Vegas vicinity was classified for disposal under the small tract program during the year.

Butler Valley in northeast Yuma County, Ariz., involving 103,730 acres of vacant public lands, was examined for suitability for agricultural entry in response to 41 applications for desert-land entry. The study resulted in the rejection of all applications.

Lands Legislation

The existing body of public land laws relating to the disposal of public lands is a maze of separately enacted laws dating back more than 100 years and amended numerous times to reflect changing conditions and special situations. As a result, there is embodied in them a lack of uniformity, some inconsistencies and conflicts and numerous obsolete procedures. In addition, some of these obsolete laws are not consistent with modern-day operations of the executive branch of the Government. In cognizance of this situation, the Bureau directed its legislative efforts this year toward modernization of the public land law. This goal involved recommendation to the Congress for repeal of obsolete laws, for consolidation and simplification of all legislation dealing with specific matters, and for greater generalization of laws now having limited applicability.

Progress is being made along these lines. The first session of the 84th Congress accomplished the outright repeal of the Timber and Stone Act of 1878, and of outdated laws requiring shore-space reservations along bodies of waters in Alaska by enactment of Public Laws 206 and 213. Both of the repealed measures in recent years proved of extremely limited usefulness, required considerable administrative expense with few positive results, and were largely inconsistent with conservation legislation and policy.

Congress also provided a means to permit a firm accounting of the toal land claims against the Government in the form of scrip, lieu selection, and similar laws by passing Public Law 247 requiring the recordation of holdings and claims with the Secretary of the Interior. Recordation will permit an evaluation of the Government's liability to holders of land claims and development of administrative and legislative proposals for the satisfaction of the "debt." Previously, the 83d Congress passed Public Law 582 partially repealing the Carey Act which granted land to States for reclamation through irrigation. Public Law 582 provides means for settlement of the Carey Act grants to States. The State of Wyoming was the first to take advantage of the new law.

Several new bills to consolidate numerous laws are now in draft stage. Principal examples are proposals to consolidate, simplify, and modernize a whole series of laws relating to creation and disposal of townsites on the public lands, and to rights-of-way for various purposes. Existing townsite laws include some which contemplate free settlement on the public domain, a situation which has not existed in the States since passage of the Taylor Grazing Act in 1934. Both proposals would repeal all existing laws on these matters and would substitute for them two single but comprehensive acts.

The 83d Congress made two significant amendments to generalize existing laws. Public Law 387 transformed the Recreation Act of 1926 from a limited recreation act to an act providing for disposals of lands for all public purposes, as well as recreation. Public Law 390 amended the Small Tract Act to make it more comprehensive both in terms of applicability and eligibility of applicants. Under consideration now is a proposal to amend the general public sale law to make it more comprehensive and workable.

Less comprehensive but useful measures passed by the 84th Congress were Public Law 76 which repealed the 160-acre limitation governing desert-land entries on lands valuable for nonleasable minerals, Public Law 77 which authorized the transfer of certain lands in Wyoming to that State for National Guard purposes, Public Law 191 to give Miles City, Mont., an additional 5 years to purchase certain lands, Public Law 215 which permits management and disposition of the so-called Choctaw-Chickasaw lands in eastern Oklahoma, Public Law 226 which permitted existing desert-land entrymen utilizing percolating waters in Arizona to perfect their entries, Public Law 258 which authorized issuance of patents to riparian owners along the Indian River, Fla., and Public Law 263 which permits the State of Utah to select mineral lands in exchange for certain State lands within the Uintah and Ouray Indian Reservation. The Congress also passed several private laws.

This is only a small part of all the bills the first session considered, indicating that the Congress despite the vast scope of existing law, must continue to delve into many new matters concerning disposal of public lands. Some of this is inevitable because changing times and special situations often require remedial legislation. Also equity and justice sometimes require deviation from the general rules in certain cases, and Congress reserves the right to consider those proposals which do not fit into the established complex of the public land laws. The Bureau, however, does follow a policy in the consideration of individual proposals to recommend either invoking of existing law or amendment of general law to make it more comprehensive and reduce to a minimum the need for the Congress to concern itself with individual transactions. Modernization of the public land laws will be a continuing goal of the Bureau's legislative program in the future.

Regulations and Procedures

The problems resulting from the existence of a vast body of public land laws are multiplied by the changing patterns of land-use and conflicting demands. Administration of the public land laws requires well-conceived guide materials for assistance to field officials in solving day to day operating problems. These are essential both to the public administrator who must make the decisions and also to applicants who should be fully apprised of their opportunities, rights, and privileges. Consequently, the Director's staff during the year placed high priority on the issuance of policy statements, manual procedures, and regulations.

A source of major difficulty last year and previously was the conflict between State selections and other applications. Since State selections in some of the States are often made on behalf of private individuals, there frequently arises a conflict between an applicant under State law and an applicant under Federal law. An overriding consideration to the solution of the problem is the obligation of the United States to satisfy the grants made by the Congress to the States. The various equities were carefully weighed and a policy statement was issued outlining fair and equitable rules for the disposition of such conflicts.

Another area of considerable difficulty was the application of the Desert Land Act of 1887 to present conditions in the West. Here again the problem is multilateral. Control of water is under State law which must be observed and respected. Stability of communities often rests on stability of water use. Proposals for water development may threaten the continued use of the land by existing users. To guide the Bureau in this situation and to inform the interested public of governing rules, the Bureau issued a policy statement covering operations under the Desert Land Act.

Other important policy statements issued during the year related to homesteading, small tracts, and disposals under the amended Recreation Act.

Work on the issuance of procedural guides through the Bureau Manual proceeded at an accelerated pace. Whereas the Lands volume was nonexistent in the spring of 1954, it now contains 54 releases, with several more in process. These up-to-date directives, which incorporate basic policy, have provided field personnel with a principal reference source, have streamlined operations and resulted in greater work output per man. The regulatory and procedural improvements applied to several fields of operation, including small tracts, disposals for public purposes, and withdrawals and revocations.

MINERALS

A major accomplishment during the past fiscal year was the complete decentralization of mining and mineral leasing cases to the various field offices principally in the Western United States. This was accomplished in line with the reorganization plan recommended by the survey team appointed by the Secretary, whose recommendations were adopted, approved, and ordered to be put in effect by the Secretary.

New legislation was introduced and enacted which will have the effect of encouraging new expansion of mineral activities and providing for the multiple use of the same tracts of Government lands for diverse mineral purposes.

In the administration of these various laws, BLM performs a basic, necessary function which contributes greatly to the proper conservation and development of the Nation's mineral resources so that they will serve not only the needs of the present generation but of generations to come.

Two of the most important new measures enacted are Public Law 555 and Public Law 561, both of which amended the 1920 Mineral Leasing Act.

The most important changes to the 1920 act brought about by these modifications are the increase in the acreage limitations on oil and gas leases and options, and the provision for terminating automatically for nonpayment of rent all noncompetitive leases on which there is no well capable of producing oil or gas in paying quantities on the anniversary date of such lease.

Enactment of Public Law 585 on August 13, 1954, was a major contribution to more efficient administration of mineral resources. It establishes a system of multiple mineral development by permitting mining and mineral leasing on the same tracts of public domain lands, and on patented lands in which the United States reserves title to the minerals.

Prior to the enactment of Public Law 585 the United States mining laws and the mineral leasing laws were mutually exclusive. A mining claim could not be filed on lands embraced in an oil and gas lease, nor could an oil and gas lease be issued by the Government for lands contained within a valid mining claim. This is now permitted under the provisions of Public Law 585.

The Bureau is responsible for implementing such new legislation by the preparation of regulations. The mineral leasing regulations were completely revised and new forms prepared, as well as new procedures for the guidance of the field personnel engaged in the adjudication of matters under the United States mining laws and mineral leasing laws.

The Bureau of Land Management engaged in numerous conferences with representatives of other governmental agencies which are vested with surface jurisdiction over certain lands, the minerals of which are subject to disposition by this Department and Bureau pursuant to various mineral leasing laws. These conferences resulted in a better understanding between the various Government agencies and this Bureau, and in the preparation of streamlined procedures for rendering more efficient service to the public.

Under the amended Atomic Energy Act of 1955, the Atomic Energy Commission is vested with authority to issue uranium leases covering public lands. The Commission has evinced a desire to transfer its leasing functions to BLM because of the Bureau's experience in mineral resource administration. It is expected that during the 1956 fiscal year these negotiations will result in a delegation of authority to the Bureau from the Atomic Energy Commission to handle such matters on a reimbursable basis.

Adjudication of Mineral Cases

The mineral activities of the Bureau increased substantially during fiscal 1955. On June 30, 1955, there were outstanding approximately 95,900 oil and gas leases on the public domain covering 71,700,000 acres. There were also outstanding 3,176 oil and gas leases on acquired lands of the United States covering 3,007,824 acres. A total of 1,218 permits, leases, and licenses for other minerals embracing 1,332,655 acres were issued on public domain and acquired lands.

During fiscal year 1955, new and reactivated noncompetitive oil and gas lease offers and applications for lease totaled 37,861 cases, and 38,676 were closed during that period. Approximately 18,505 oil and gas lease assignments were closed during the period.

As the result of the continued and greatly expanded search for uranium and other critical materials on the public domain, activities under the United States mining laws were greatly increased at a time when the various land offices were shouldering the additional burden of processing all applications under the mining laws. During fiscal 1955, 334 mining patent applications were received, as against 243 in fiscal year 1954 and 156 mineral entries were approved and patented as against 106 during fiscal year 1954.

Table No. 1 summarizes the number of mineral cases adjudicated in the continental United States and in Alaska during fiscal year 1955.

Revenues

Mineral leasing is the chief source of revenue derived by the United States from the use and disposal of the resources on the public lands. The revenues realized in fiscal year 1955 from royalties, rentals, and filing fees under the mineral leasing acts totaled $59,861,932.39, compared with $55,861,932 in fiscal year 1954. Another major source of receipts was bonus bidding for the right to lease lands in known oil and gas areas. A summary of the bonuses received from mineral leasing by States on lands within known geologic structures, as well as on the Outer Continental Shelf is contained in table No. 2.

Outer Continental Shelf

Interest in the leasing of submerged lands in the Outer Continental Shelf was the highlight of fiscal year 1955. As of June 30, 1955, 492 leases were outstanding covering 1,583,000 acres of OCS lands.

Important developments were establishment of an Outer Continental Shelf office of the Bureau at New Orleans, La., and the delegation of authority to the manager of that office to take action on mineral leases under the Outer Continental Shelf Act of August 7, 1953.

The first two sales of mineral leases in the Gulf of Mexico off Louisiana and Texas were held on October 13 and November 9, respectively, in Washington, D. C., resulting in the issuance of 114 leases covering 461,869.86 acres of oil and gas lands and 25,000 acres of sulfur lands. Total bonuses and rentals of $142,404,630.48 were covered into the Treasury. Of the 404 applications filed to conform State issued mineral leases under section 6 of the act, less than 50 remained to be processed; most of these were Texas State leases awaiting official determination of the outer boundaries of that State.

A number of bills and resolutions introduced in the 84th Congress, proposing various amendments to the OCS Act, were received for analysis and recommendation. New regulations for rights-of-way for pipe lines on the OSC were proposed and published in the Federal Register.

During the year, the sum of $22,041,994.66, which represented the amount owing to the State of California under the Submerged Lands Act from operations on the submerged lands along the coast of California, was duly paid by the Federal Government from funds in escrow.

A vast increase in mineral activities during the 1956 fiscal year is anticipated.

TABLE 1.—*Mineral adjudication operations in continental United States and Alaska, fiscal year 1955*

Type of case	Unclosed cases July 1, 1954	New and reactivated cases, fiscal year 1955	Cases closed during fiscal year 1955	Unclosed cases June 30, 1955
Public domain lands:				
Oil and gas leases (noncompetitive)	11,113	35,538	36,692	9,959
Oil and gas leases (competitive)	1	479	408	72
Mineral leases	112	485	392	205
Mineral permits	1,757	1,446	1,394	1,809
Acquired lands:				
Oil and gas leases (noncompetitive)	3,797	2,323	1,984	4,136
Oil and gas leases (competitive)		121	13	108
Mineral leases	7	5,809	173	5,643
Mineral permits		890	17	873
Mineral locations (patent applications)	641	360	295	706
Mineral locations (miscellaneous)	14	229	215	28
Oil and gas assignments (record title)	1,536	23,552	18,505	6,583
Resource sales	34	71	58	47
Outer Continental Shelf leases (sec. 6)		230	185	45
Outer Continental Shelf leases (sec. 8)		109	109	
Total	19,012	71,642	60,440	30,214

TABLE 2.—*Competitive leases, fiscal year 1955*

Mineral and State	Total[1]		Acquired lands		Public domain	
	Acres	Bonus	Acres	Bonus	Acres	Bonus
Oil and gas:						
Colorado	801.36	$58,527.89			801.36	$58,527.89
Louisiana	360.06	5,629.41			360.06	5,629.41
Outer Continental Shelf	1,381,767.23	116,378,476.00				
Michigan	40.00	3,044.40			40.00	3,044.40
New Mexico	5,113.90	180,261.69			5,113.90	180,261.69
North Dakota	6,908.17	76,482.07			6,908.17	76,482.07
Texas: Outer Continental Shelf	202,508.70	23,357,929.48				
Wyoming	2,921.69	509,359.86			2,921.69	509,359.86
Total, oil and gas	1,600,421.11	140,569,710.80			16,145.18	833,305.32
Other minerals:						
Coal: Kentucky	458.00	503.80	458.00	$503.80		
Manganese: Virginia	2,291.00	1,500.00	2,291.00	1,500.00		
Phosphate: Montana	560.00	2,800.00			560.00	2,800.00
Sodium: California	10.00	410,000.00			10.00	410,000.00
Sulfur: Louisiana, Outer Continental Shelf	25,000.00	1,233,500.00				
Total, other minerals	28,319.00	1,648,303.80	2,749.00	2,003.80	570.00	412,800.00
Grand total	1,628,740.11	142,218,014.60	2,749.00	2,003.80	16,715.18	1,246,105.32

[1] The total column includes Outer Continental Shelf data not shown elsewhere.

RANGE MANAGEMENT

Fiscal year 1955 was marked by generally unfavorable climatic conditions for livestock operations throughout the public land range area, with the exception of parts of Montana. Severe drought continued to plague the Great Plains, Intermountain, and Southwest ranges. Scattered storms brought temporary local relief but failed to overcome the effects of a cumulative deficit in moisture. The drought in some areas, notably Wyoming and parts of the Southwest, was the worst in history.

Aggravating the drought was a long, hard winter in the Northern States, with short feed supplies causing a sharp decline in the condition of livestock. Many operators were forced to dispose of part or all of their breeding herds. The Bureau remitted grazing fees to numerous operators whose ranges failed to produce sufficient forage to sustain their herds. A new regulation was placed in effect to enable the remission of rentals on section 15 grazing leases, a provision heretofore unnecessary.

The severe winter was followed by a long-delayed spring and tardy development of range forage. Turnout dates for livestock were the latest in history in some areas. Indications of a break in the drought occurred when late spring rains improved forage and stock water supplies in many range areas. There were still localities where the drought continued unabated and livestock operations were in a critical state, however.

Progress in Range Administration

The highlight of grazing administration in the past year was the adoption of a new formula for determining grazing fees. Instead of basing fees on administrative costs, the new formula provides for charging grazing fees equal to the average price per pound of cattle and sheep at Western markets. The new formula will become effective on January 1, 1957. For the calendar years 1955 and 1956 an arbitrary increase in fees of 25 percent was agreed upon. Beginning with 1955, the range improvement fund will be derived from 25 percent of the grazing fee per animal unit month, rounded to the nearest whole cent.

Revision of the Federal Range Code for Grazing Districts was another major accomplishment of the past year. This undertaking has been in progress for several years in order to improve the enforcement of the Taylor Grazing Act and to bring the language of the regulation into line with existing practices. The National Advisory Board Council and the grazing district advisory boards cooperated in developing and drafting the revision.

The adjustment of grazing obligations on the Federal range to the grazing capacity continued to receive primary attention. Encouraging progress was made in the reappraisal of grazing privilege adjudications with the support of new range inventory and dependent property survey data. There has been a general tightening of dependent property survey standards and more exactness in assembling the information. The result has been a steady decline in unqualified demand and improper grazing practices on the Federal range.

A noteworthy increase in cooperation and team work between Bureau employees and stockmen users of the Federal range has facilitated stocking adjustments, dependent property surveys, trespass control, and other range activities. This development is doubtless due to an increasing conservation-mindedness among stockmen generally, possibly attributable in part to the prolonged drought.

With an accelerated adjudication program, many adverse decisions have been rendered, and while the backlog of pending grazing appeals has grown, the increase is not proportional to the number of users affected. Satisfactory agreements were often reached when range managers and permittees worked together on the ground to make necessary adjustments in use.

Wildlife Management and Recreation

The management of wildlife is strictly on a basis of cooperation between the BLM as the administrator of vast public land acreages, supporting large wildlife populations, and the respective States recognized as the owners of the wildlife.

Cooperation starts with joint consideration of all aspects of management by the State game departments and the Bureau and other land-managing agencies or individuals. This work goes on constantly and usually culminates in a series of annual meetings held in the respective States where full and frank discussion of all points of controversy are compromised or settled. Bureau representatives attend local and national meetings to present our story of management of the public range lands. Wildlife problems of mutual interest to other agencies such as the Forest Service and Fish and Wildlife Service receive constant attention. Joint investigation and study of problem areas is made as, for example, on the Fort Peck Game Range in Montana. Here a four-way agreement among the Corps of Engineers, Fish and Wildlife Service, State of Montana, and the BLM is necessary to provide coordinated management of the area.

The general public must also be kept informed as to the status of wildlife. Cooperation with the public is provided for by the system of local State and national advisory boards serving the Bureau, each of which now has wildlife representatives. The Bureau broadened the scope of this representation during the past year by having for the first time three wildlife representatives on the National Advisory Board Council which acts in an advisory capacity to the Director's office in Washington.

In the field of recreation the Bureau's activity is chiefly confined to Alaska, although extensive cooperation is given other Federal, State, and local groups in the States. In Alaska the Bureau cooperated with the Territorial Department of Fisheries and the Fish and Wildlife Service in the selection of lands for reservation as public recreation and service sites along the Alaska Highway.

Range Studies

Enlightened management of the rangeland calls for basic knowledge of the land and the vegetation which it is supporting. Studies to determine existing conditions are usually referred to as range inventories. The Bureau is making every effort to step up this program and range forage inventories are now being made in most range districts which have not completed this work.

Following inventory must come studies to determine why the range and soil is in the condition it is in; what is the overall trend of condition, up or down; and what method of treatment or type of use must be made to improve it.

The Bureau is rapidly expanding the scope of such work. Range studies have been spotlighted as a necessary program for every field office. They are being made on a varying scale—intensive, in critical or key areas, and extensive elsewhere, in order to provide as much coverage of range as possible. A Bureau employee has devised a new approach to extensive study of the range which will make it possible to ascertain conditions on a much greater acreage than has hitherto been possible. This year marked the first attempt by the Bureau to assemble a report of range condition and trend of all Bureau lands, exclusive of Alaska. This report will be submitted each year and steady improvement is expected as to reliability of information and scope of country studied.

Range studies of this nature are often made jointly with private individuals or groups, States, or other Federal agencies. Cooperative vegetal studies of our ranges have been set up in many areas. An example is the Little Hills Experiment Station in Colorado. where a series of deer and livestock enclosures are undergoing careful study and recordation of use to determine the degree of livestock-big game competition for forage and other management factors. Cooperative study of game ranges by the use of intensive line transect stations has been set up on BLM-national forest-private ranges in eastern California and western Nevada under the leadership of the California State Game Department.

In Alaska the Bureau is cooperating on a research project with the Alaska Agricultural Experiment Station and other Federal agencies to reevaluate the physical and economic bases for range land use and development on Kodiak and adjacent islands.

Soil and Moisture Conservation

Conversion of S. and M. C. activity to watershed protection planning was virtually completed at the end of the fiscal year. This conversion places the Bureau's soil conservation program in readiness for the first year of the Department's 20-year program of conservation treatment for all Interior lands in continental United States. The Bureau now has reasonably reliable estimates of the total conservation requirements for all public lands in the major western river basins. These estimates will enable the establishment of watershed priorities and the orderly scheduling of operations.

The conversion to watershed planning is also timely in that the Bureau's program is immediately susceptible of close coordination with the Department of Agriculture's watershed protection program authorized by Public Law 566, 83d Congress. This law directs Interior to cooperate with Agriculture in providing for public lands in watersheds eligible to receive assistance under the act. During the past year this program was just getting under way with one or two watersheds containing public lands approved for planning in each of the Western States. As the program develops it is anticipated that it will become an important supplement to the Bureau's soil conservation activity.

The preparation of community watershed plans, the next step in converting the Bureau's program to a watershed basis, has proceeded according to schedule. Most of the grazing districts are working on at least one plan and several have been completed and submitted for approval. These plans are usually cooperative endeavors with our Federal, State, and local agencies with an interest in the watershed participating in planning phases.

Range reseeding occupied a prominent place in the 1955 fiscal year conservation operations as a result of congressional action. The Dworshak bill, Public Law 524, transferred 252,000 pounds of surplus forage seeds from the Commodity Stabilization Service to the Bureau for seeding public lands. Also, a House recommendation earmarked funds for aerial seeding either with or without pelletized seed. The two actions were combined to the extent of using some of the surplus seed for aerial seeding. A total of 37,500 acres of depleted range located in eight Western States was covered in the aerial seeding program. Of this total, 2,000 acres at two locations in Idaho were seeded with pelletized seed as a large scale trial of this method. Preliminary results based on careful check plots, installed and recorded by the Agricultural Research Service show no advantage in using pelletized seed.

Range users have customarily cooperated with the Bureau in placing conservation works on the public lands by contributing labor, materials, and funds. During the past year interest in range conservation work has increased markedly and users have been more cooperative. This fact was noted above under progress in grazing administration and is equally true of other range management programs. The greater interest in conservation practices can be attributed in part to the success of past Bureau efforts to restore and improve the public land ranges. Also important, is the educational influence of pilot soil conservation districts, some of which have been operating for four years and are receiving favorable local publicity. The Bureau has consistently supported the pilot district movement and is abreast of scheduled conservation work on public lands included in such districts.

Range Improvement

A revised policy governing the distribution of range improvement funds shifted the emphasis in 1955 from new construction to the maintenance of existing improvements. A substantial part of the maintenance load, however, is borne by range users under cooperative agreement permitting new construction to proceed at near normal level. The accomplishments in this program during the past year in a measure reflect the accelerated effort on range adjudication since fencing generally received the major emphasis. With range lines and allotment boundaries permanently established, there is an understandable desire on the part of the users to fence the range. The usual practice followed by the Bureau is to furnish the wire, with the users furnishing other materials and labor to construct the fence.

Private construction of range improvements on the public lands authorized by section 4 and section 15 permits increased in volume over previous years. Here again the Bureau's stepped-up adjudication program is reflected in the amount of fencing completed and the installation of stockwater facilities and other improvements.

Halogeton Control

Encouraging results have been obtained in the Bureau's halogeton control program. While this poisonous plant is still a serious threat, definite progress has been made in slowing down its rate of spread to new lands and in some areas the plant is being successfully controlled.

Between 1952 and 1954 the acreage of Bureau land infested jumped from a little over 1 million acres to more than 4 million acres. Recent surveys disclose that the exterior boundaries of the gross area of infestation have not been materially extended since 1954, except in areas where control measures could not be carried out. There have been sharp increases in untreated areas, areas within or near major infestations, and new spot infestations, widely scattered, are occurring.

Major emphasis has been placed on the seeding of infested and threatened ranges to hardy perennial grass as the most practical way to control halogeton. The hardy grass crowds out or prevents the spread of halogeton and produces forage for livestock removed from areas of infestation that are unsuitable for reseeding.

Approximately 81,000 acres of rangeland were seeded in fiscal year 1955, bringing the total acreage seeded since inception of the program in 1952 to about 403,000 acres. In all reseedings the Bureau has been successful in obtaining the full cooperation of the range users in project development and subsequent management and use. Range users have contributed seed, fencing, labor, and funds to help in financing the project. Contributions have been averaging about 24 percent of the total cost of the project.

An unusually high degree of success has been obtained in the reseeding program thus far, and the successful seedings in all cases are eliminating halogeton or reducing the volume present below critical quantities. As the grass becomes more firmly established with maturity it is anticipated that halogeton will be completely eliminated, except in small areas of poor soils where it is not possible to obtain a dense vigorous stand of grass. Several of the reseedings were grazed by livestock for the first time in the fall of 1954 and the spring of 1955. This made it possible to reduce the grazing use in the surrounding range and allow for its gradual improvement. In areas where reseedings have been able to absorb a relatively high percentage of grazing capacity of an area, significant improvement can be seen in the native range as a result of the reduced use.

Chemical Control of Halogeton

In the Bureau's chemical program, the objective is to eradicate small isolated spot infestations, prevent seed production and reduce the rate of spread in perimeter areas and along avenues of spread. About 83,500 acres have been treated since 1952 and about 15,000 acres are sprayed on an annual basis. Several small spots have been eradicated and infestations along avenues of spread and in perimeter areas have been materially reduced.

In 1954 and 1955 research agencies developed important basic information on the life history of the plant and on the proper application of chemicals to the weed which will enable the Bureau to carry out a more effective control program in 1956 and in future years. The Bureau's chemical control program is largely carried out as a coordinated cooperative program with local and State weed and plant pest control groups, State highway departments, railroads, private landowners, and others.

Other Halogeton Control Methods

In the drier, poor soil areas of the Federal range where reseedings cannot be successfully established, the Bureau is attempting to control halogeton by better range management. The objective is to improve the hardy native range plants in vigor and density to such a degree that halogeton will be crowded out. Management fences to control grazing, water spreading, and contour furrowing projects to catch and utilize additional moisture and reduction in grazing use are practices used in this program. While this is a long-range means of control it will be more permanent when once accomplished. Since inception of the program more than 1,000 miles of protection and management fences have been built and more than 87,000 acres have been included in forage development projects. In several of these areas it appears that the native vegetation is gradually crowding out halogeton.

In addition to the Bureau's control program, surveys are carried out annually to determine areas of infestation, avenues of spread, and appropriate control measures. Good cooperation has been obtained from State and local people and agency representatives in reporting new infestations.

The Bureau also cooperates with the State land-grant colleges and research agencies of the Department of Agriculture on an annual basis in research programs designed to find better methods of control. Considerable information has been developed that has greatly benefited the Bureau's control program. This important phase of the program will be continued in the future.

During the fall of 1954 and winter of 1955 the Bureau made an appraisal of its halogeton control program to determine its good and bad features and to obtain suggestions from others that would aid in improving future work. State and local committees composed of personnel from the State colleges, extension services, the Department of Agriculture, State fish and game commissions, key ranchers, and other local and State people assisted in making the appraisal. They commended the Bureau on its overall approach to the halogeton problem and urged that an aggressive program be continued until halogeton is controlled.

FORESTRY

The Bureau manages approximately 161,500,000 acres of forest and woodland in the United States and Alaska. Of this, approximately 36,496,000 acres are in the continental United States, 6,376,000 acres being commercial forest land and 30,120,000 acres, noncommercial or forest woodland. The 125,000,000 acres in Alaska contain

40,000,000 acres of commercial forest land and 85,000,000 acres of woodland.

This tremendous acreage is estimated to embrace almost 260 billion board-feet of timber on the commercial forest lands alone with another 212.5 billion board-feet standing on the less productive woodlands. Although no accurate inventory has been made of a large portion of this area, Bureau foresters estimate that the productive capacity of these forest and woodlands approximates 3.5 billion board-feet per year, or enough lumber and equivalent wood products to construct 350,000 five-room homes each year in perpetuity. The drain of forest products from this great reservoir was 763 million board-feet in fiscal year 1955.

Bureau Timber Sale Business

The value of timber sold from Bureau forest lands in fiscal year 1955 was the greatest in the history of the Bureau. The volume disposed of in fiscal year 1955 and the sale value were 763,243,000 board-feet of timber and $19,903,301.45, respectively, compared to 696,115,000 board-feet of timber valued at $12,627,521 sold in fiscal year 1954. These figures include timber involved in trespass settlements.

Timber from the Oregon and California Railroad and Coos Bay Wagon Road grant lands accounted for 644,608,000 board-feet of the total sold and $18,337,387.55 of the total value. Public domain timber sales and other types of disposal accounted for the remainder, 118,635,000 board-feet of timber valued at $1,565,913.90.

During this period, the Bureau expended $2,644,840 for the management and protection of these lands. This represents a ratio of expenditures to income of 1 to 7.5 or $7.50 earned for every dollar spent on management and protection. Even after distributing substantial shares to the various public land States and counties, the Federal Treasury realized a net $3,347,000 income for fiscal year 1955.

In addition the Bureau expended $2,500,000 on the construction of timber access roads on O. and C. lands in western Oregon. These roads are designed to tap a tremendous volume of salvage timber in inaccessible areas which would be lost entirely if not salvaged soon. This expenditure is in the nature of a capital investment, using funds which normally would have been distributed to the O. and C. counties in Oregon. This investment will be repaid in full with net gains both to the counties and the Federal Treasury through higher sales revenue resulting from wider, more efficient harvesting. From its inception in fiscal year 1951 approximately $8,550,000 has been spent on this program as of June 30, 1955. As a result approximately 113 miles of heavy-duty logging roads have been built or are under construction.

Public Domain Forests

The Bureau is faced with several distinct and separate problems in its efforts to conduct a financially sound and conservationwise forest management program. These may be simply described as problems of land ownership and economic development.

In most of the public land States, the forest land administered by the Bureau is admittedly the poorer forest land, remnants of the once all-inclusive public domain from which were carved the national forests and extensive private holdings. These scattered stands have many important values only one of which is the actual yield of forest products. The value of forested land for watershed protection, scenic or recreational use, wildlife and grazing, can be destroyed or at least seriously impaired by timber cutting which has not been planned with consideration of these factors. The forest and woodlands of the public domain within the United States, not counting the O. and C. lands, constitute approximately 4½ million acres covered with saw timber stands and 30 million acres covered with woodland types. Development of a high-level sustained-yield rate of cutting has not been achieved as yet. Increasing demand for the products grown on these lands assures a ready market. Continued and increasing effort by the Bureau is called for to realize the full productivity of these lands. At the present time, timber operations are at about 20 percent of what could be considered an adequate management level on these public domain lands.

Establishment of a district forestry office at Coeur d'Alene, Idaho, to facilitate all management activities over more than 200,000 acres in northern Idaho was a major step forward in an expanding forest management program.

Lack of adequate inventories still hampers attainment of a well planned management program. During the past year some small gains were scored in this activity but they were far from adequate in view of the tremendous need and the total job ahead.

In general, the limiting factors in the administration of a management program for these lands during fiscal year 1955 were the capacity of available manpower to provide even minimum conservation measures essential for proper utilization of existing timber as well as future growth, and the inadequate knowledge of the extent of the resource.

In spite of these handicaps, values realized from these lands continued to rise during the past year. Income exceeded expenditures by over 2 to 1, thus emphasizing future possibilities.

The last major reservoir of untouched timber under the American flag is located in Alaska. The more than 125 million acres of forest and woodland under the jurisdiction of the Bureau in Alasaka hold promise of a great contribution to the economic welfare of the nation. At the present time one of the major concerns of the Bureau in its management of these lands is their protection from fire. On a much smaller scale the Bureau conducts a timber sale program fulfilling the requirements of local sawmills and settlers. During the past year, the timber sale business in Alaska realized an income of $19,130.

During the past year the Bureau has developed a specific forestry program for Alaska which outlines in detail the needs of the territory in research, forest inventory and resource development. The plan calls for doubling of the forest management and fire protection activities of the Bureau in Alaska. Efforts will be made to place this new program into effect during the next few years.

O. and C. and CBWR Land

The O. and C. Act of August 28, 1937 required that the forests on the O. and C. lands in western Oregon be managed in accordance with the principles of sustained-yield management. This was the first instance of Federal lands being specifically earmarked by Congressional action for application of sustained-yield forestry. Every year since then the volume of timber sold and the value of that timber have increased.

As a comparison, the Bureau in fiscal year 1947, 9 years ago, sold 448,722,000 board-feet of timber valued at $3,085,425. This was 84 percent of the presently established sustained-yield allowable cut of 534,451,000 board feet per year. During fiscal year 1955, the Bureau sold 644,608,000 board-feet valued at $18,337,387. This was close to the presently established allowable cut. A large volume of this timber was salvage material. Sustained-yield forestry proved to be a lucrative business on the O. and C. lands during fiscal year 1955.

In addition many other management activities were carried out during the past year. Several thousand acres of forest land were planted with Douglas-fir seedlings to assure a continuing high level of productivity 100 years from now. Also, additional thousands of acres of cutover forest land were seeded to Douglas-fir and other species. Closing the gap between cutting time and the reestablishment of a new stand permits higher annual cutting ratio in the presently mature timber in addition to more efficient management in the future.

In the closing days of fiscal year 1954, Congress directed the Bureau and the Forest Service to effect an exchange, based on equal value, of the lands administered by the two agencies where such lands were intermingled. This exchange involves almost 1 million acres of forest land, half being national forest and half O. and C. land. When completed, this exchange will remedy the overlap of jurisdiction of the two agencies in western Oregon by blocking up the lands affected. It will also improve the administration of these lands by more efficient groupings of land and by reduction in the public confusion over management rules and practices of the two agencies operating in the same area. Congress imposed a 2-year time limit for the completion of the exchange. During the past year almost all the field work has been completed and it is expected that the exchange will be consummated well within the period set by Congress.

Trespass

The scattered nature of many Bureau of Land Management lands emphasizes the difficulties experienced in the development of an adequate trespass control program. Recent Bureau decentralization has contributed greatly to progress in this activity but increasing use of the public lands also increases the possibilities of overt or inadvertent trespass. This was true during the past year and will continue to be true as long as the use and the value of the public land resources continue to rise. More adequate supervision of land-use would do much in alleviating this problem.

Access Roads

The Federal access road program initiated on the O. and C. lands during fiscal year 1951 continued at an accelerated pace during the year. The Bureau is attempting to carry out this program with the full cooperation of the local landowners. During the past year several long-term agreements were negotiated which assured the early completion of road construction into heavily damaged stands of mature Douglas-fir.

Forest and Forage Protection

Adequate protection from fire, insects, and disease is essential to successful management of the Bureau's extensive timber and forage resources.

The emphasis placed on fire protection during the past several years by the Bureau of Land Management is showing results in both the United States and Alaska. In spite of the limited funds appropriated for protection, much has been accomplished to improve fire control for the forest lands under BLM jurisdiction—some 225 million acres in Alaska and 180 million acres in the United States.

Since formal protection was extended to Bureau lands, cooperation with other agencies, Federal, State, county, and private has been considered essential. In the United States the great extent of BLM lands intermingled with other ownerships has made cooperation in fire control imperative.

Development of better fire plans has made possible efficient operation on most fires while keeping the manpower requirements at a minimum. Use of mechanized fire equipment which minimizes manpower requirements on most fires has made possible a marked reduction of fire severity, i. e. acreage burned per fire.

Very high frequency (VHF) radio has been used successfully to furnish dependable communications in the severe fire danger districts of Idaho and eastern Oregon. VHF radio has also been installed on one district each in Montana and Arizona and on two districts in Nevada. Radio telephone is used successfully in one district each in Nevada and Utah. Both VHF radio and radio telephone permit noise-free reception during periods of high electrical activity common during electrical storms and other periods of high fire danger. At present long-haul transmission makes medium frequency radio more adaptable for use in Alaska. All radio equipment except that in the aircraft has been rebuilt from radios obtained from military surplus.

High-pressure pumpers mounted on multiple drive trucks have proved so satisfactory in suppressing grass and brush fires that they have been adopted by the Bureau as standard fire-fighting equipment. As funds become available, all districts will be equipped with these pumpers. The Pacific Marine type pumpers are better suited for use in the forests of Alaska, although in some places the high pressure pumper has also proved to be equally effective in Alaska.

Three Grumman amphibian aircraft were acquired in 1953 through transfer from the Navy for use in Alaska fire control. These aircraft have ben used very effectively to transport fire fighters and equipment to lakes and airstrips near fires, thus reducing the elapsed time for discovery to initial attack. With three 4-place, wheel-type planes for patrol, scouting of fires, and for air-to-ground radio contact with fire fighters on the fireline, the efficiency of the fire organization has been greatly increased. Further progress has been made in aerial cargo dropping. Tools, equipment, and food have been supplied in this way to men on the fireline.

Contract protection of nearly 4 million acres of public domain, forest and woodlands in the States of California, Idaho, Oregon, Montana, Washington, Arkansas, and Minnesota was continued. These lands are scattered and intermingled with ownerships of other agencies having protection organizations. For the Bureau to protect these lands under force account would be a duplication of effort. An additional 2,142,000 acres of BLM-administered O. and C. lands in western Oregon bearing high-value Douglas-fir saw timber are protected by contract with the State of Oregon and the Forest Service.

Greater emphasis has been placed on improvement of the fire training program by extending the training to per diem guards and by requiring a larger number of Bureau of Land Management employees to attend the training schools. Bureau of Land Management attendance at fire training schools in cooperation with other agencies has also been increased.

Insect control.—Insect infestations are difficult to detect and may be present for several years before damage is noticeable. They often reach epidemic proportion before adequate control measures can be effected. While far less spectacular than fire, annual damage by insects exceeds that of fire and the ravages are much more difficult to control. The infestation of Douglas-fir bark beetle in the Douglas-fir region of western Oregon, California, and Washington during the past 4 years reached its peak toward the close of 1954.

Favorable breeding conditions were created by numerous fires in western Oregon and the extensive blow-down by the heavy wind storms of 1951, 1952, and 1953. There were over 10 billion feet of blowdown timber distributed over an area of 13½ million acres with an estimated 3 billion feet on the 1.4 million acres which are under BLM jurisdiction. Because much of the blowdown is inaccessible and in small scattered pockets, it cannot be salvaged economically. This condition continues to create a breeding ground for the beetles. At present there is no effective means of control other than removal of the fire-killed and wind-thrown timber to minimize their spread. To make salvage operations possible, it was necessary to build access roads into the larger bodies of damaged timber.

Since 1952, approximately 1.3 billion feet of damaged timber have been salvaged from areas that could be reached from existing roads. By the fall of 1955, approximately 50 miles of access roads were ready for use, providing access to large bodies of previously inaccessible, beetle-damaged timber.

A beetle infestation in northern Idaho resulted in considerable damage to spruce timber on Bureau of Land Management lands. More than 20 million board-feet were salvaged during the past year.

The spruce budworm infestation in the Ochoco and Malheur National Forests and in the Powder River and Baker watersheds in eastern Oregon will receive treatment in fiscal year 1956. This will affect approximately 14,000 acres of BLM lands adjacent to or intermingled with the national forests and lands of other ownerships.

Disease control.—As high demands on timber continue, it becomes more important that prevention and control of disease in all kinds of timber should be given increased attention. The only known epidemic tree disease affecting Bureau-managed timber is white pine blister rust, a disease common to the 5-needle pines. A blister rust control program was started in 1942 on 150,000 acres of commercial sugar pine near Medford, Ore. The present project area is 98,419 acres. During the last field season, 2,131 acres were treated with initial eradication and 10,788 acres with reeradication.

As a sanitation measure, timber sale contracts for BLM timber in New Mexico stipulate the removal of all mistletoe and conky trees along with other merchantable timber. Further damage to young timber is thereby reduced.

CADASTRAL SURVEYS

The Bureau of Land Management is the official agency for conducting the cadastral surveys of the public lands. These surveys determine the official marking of land boundaries and are therefore basic to the management of the lands and the development of resources throughout the Western States and Alaska. The intermingling of privately owned lands with the public lands has made this function one of outstanding importance as the boundaries of the public lands must be known and actually marked on the ground before the agency administering those lands can successfully carry on its operations.

Most of the public lands are situated in the 11 Western States. In those States there are more than 100 million acres of public land over which the cadastral survey "net" has never been extended. In addition, over 50 million acres of public land in the 11 Western States are in need of resurvey to rehabilitate and redefine the corners and lines marking the boundaries of the public lands. On the other hand, more than 1.3 billion acres comprise the total area which has been surveyed.

The cadastral survey program of the Bureau of Land Management for fiscal year 1955 was designed to aid in the development and conservation of the natural resources, to provide homesites for our increasing population, and to mark out on the ground the boundaries of lands which the States were granted for benefit of their schools. Consideration was given to making surveys and resurveys in those areas which would result in the production of revenue, as well as stimulus to private industry. In Oregon, for example, the timber sale program has been retarded because surveys are necessary to define the boundaries between private and Federal lands, for settlement of trespass, and for the determination of the boundaries of sales units.

A major item in the program included the survey of school sections. By provision of law, the States situated in the area of the public domain are entitled to certain specified sections in each township for school purposes. The sections must be surveyed before the States can secure title to them. The vast increase in the development of the resources of the public lands has created an increasing demand for their survey since the removal of those resources depletes the value of the land and would tend to reduce the future returns to the States of revenue from their school lands.

The subdivision of areas into units of 5 acres or less to meet the demand for homesites and the resurvey of areas for oil and gas leasing and exploration, where the original survey monuments have been obliterated, constituted a material part of the program. In Alaska, surveys were made primarily for settlement purposes and to accommodate the expanding economy of that Territory.

Surveys in Continental United States

Cadastral survey projects completed during the past fiscal year consisted of the survey or resurvey of 1,241,734 acres of land. The surveys included such essential work as the identification of the sections granted to the States for their schools; the survey and resurvey of mineral lands as an aid in the development of those resources, principally oil and gas; the resurvey of forest areas to define the boundaries of timber management units and provide a basis for timber sales; the survey of grazing lands for range improvements; and the survey of small tracts to provide home and business sites to meet the demands for our increasing population. Additional projects were carried on by BLM to facilitate the land management activities of other Federal agencies such as extensive resurveys for the Bureau of Reclamation in the Missouri River Basin; the establishment of the boundaries of the Coronado National Memorial in Arizona, and the Everglades National Park, Fla., for the National Park Service; the subdivision of areas in Arizona to accommodate the transfer of lands by the Department of the Air Force; and resurveys for the National Forest Service in Colorado.

The program also included miscellaneous surveys and investigations including the survey of islands and omitted land areas. Numerous maps and diagrams were prepared for the Department of Justice in connection with pending litigation involving claims by the Indians.

The survey of school sections made almost a quarter of a million acres of new lands available to three western States. Although there are large areas of unsurveyed land remaining in all the western States, the need for completing the original surveys in order that the States may obtain title to the school lands exists primarily in Utah, Arizona, and California. In the other western States the unsurveyed areas are located principally in permanent reservations such as national forests, Indian reservations, national parks and monuments, etc., and title to the designated school sections would not pass to the

States even when surveyed. Furthermore, indemnity selections have been taken by the States for a large portion of the designated unsurveyed school sections in the reservations and the school land grant to those States, to a large extent, has been satisfied.

In order to make the maximum quantity of school lands available to the States, the Bureau adopted the plan of surveying and monumenting only township boundaries and only the boundaries of the school sections in each township, instead of making a complete subdivisional survey. Since there are 36 sections in each township, not more than 4 of which are designated school sections, this method made it possible to survey nearly three times more school sections than could have been surveyed if the townships were completely subdivided. In general, the program of work was based on the desires of the States to cover the areas of greatest value and interest. During the year, the school sections surveyed and marked on the ground totaled 137,840 acres in Utah, 60,160 acres in California, and 39,520 acres in Arizona—an aggregate of 237,520 acres.

Outer Continental Shelf

During the fiscal year, leasing maps were completed covering approximately 12 million acres of the Outer Continental Shelf offshore from Louisiana and 8 million acres lying in front of Texas. These maps in general cover the area extending seaward from the coastline to a depth of about 120 feet. They are basic for determining location on the ground and for providing descriptions and areas for the water-covered areas being leased for oil, gas, and sulfur as result of the passage of the Outer Continental Shelf Lands Act on August 7, 1953.

Alaskan Surveys

The basic requirement for land settlement in Alaska, as in any other public land area, is the establishment by cadastral survey of the boundaries of the tracts to be settled upon. The field program was designed to meet the needs of the increasing population in the Territory and to accommodate the expanding economy. Less than 1 percent of the vast area of Alaska has been surveyed and the need for accelerating the cadastral surveying programs is pressing. During fiscal year 1955 funds allocated to Alaska for cadastral survey were increased approximately 60 percent over the allocation in fiscal year 1954.

The program for the fiscal year included the survey or resurvey of approximately 75,000 acres of land under the rectangular system, compared to 22,000 acres in fiscal year 1954. In addition the program included the survey of 297 small tracts, 32 miles of highway and railroad traverse, 38 homesteads, 33 homesites, 10 trade and manufacturing sites, 7 headquarters sites, 1 Alaska Public Sale Act, 1 Territorial airfield, 1 United States reserve, 4 recreation sites, 423 lots in 4 townsites, 2 Indian allotments, 2 miscellaneous surveys.

FISH AND WILDLIFE SERVICE

John L. Farley, *Director*

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IN EXERCISING Federal responsibilities for the Nation's fish and wildlife resources, the Fish and Wildlife Service this year has strengthened its teamwork with State and Federal agencies, other organizations, and industry. Under the Saltonstall-Kennedy Act, promotional service and biological and technological research is benefiting the fishing industry. Wildlife and fish restoration under the Pittman-Robertson and Dingell-Johnson Acts continues to improve those resources. Closer relations with the States have been achieved in the administration of migratory bird laws.

UTILIZING THE COMMERCIAL FISHERY RESOURCES

The Service's commercial-fisheries activities in exploration, technology, market development and education, statistics, market news, and economics were expanded considerably during the year. Funds were made available by the Saltonstall-Kennedy Act to strengthen the American fishing industry, with emphasis on research and marketing.

Continuation of tuna explorations by the research vessel *Oregon* produced valuable information on the distribution and seasonal availability of various species of tuna in the Gulf of Mexico and adjacent waters of the Caribbean Sea. Technical assistance and advice were furnished to a number of commercial fishermen who converted their vessels to enter this new fishery, first discovered by the *Oregon* in 1954.

In Alaska, the exploratory vessel *John N. Cobb* completed a survey of potential summer fishing grounds in the Prince William Sound region. Commercially important discoveries were made of Pacific Ocean perch, sablefish, shrimp, and king crabs.

The trawler *Delaware* completed a number of exploratory cruises in deep waters of the Gulf of Maine. Good catches of large ocean perch and large lobsters were made, and a shrimp resource formerly fished was relocated in more northern waters. Research on Maine herring was started, with transfer of the research vessel *T. N. Gill* to Boothbay Harbor, Maine. Bluefin-tuna exploration was continued, with several good catches despite two hurricanes that disrupted the project.

At the Coral Gables, Fla., gear-research station, midwater trawls and shrimp trawls were successfully studied in operation with underwater television equipment. Recordings of sounds produced by commercial varieties of shrimp were obtained for the first time.

The program for the development of voluntary Federal standards of grade and condition of fishery products, begun last year, has moved ahead with gathering momentum. The standard for Maine sardines was completed and is in use by the State and the Maine sardine industry. Standards are being developed for frozen cooked fish sticks; fish blocks, the raw material from which fish sticks are usually made; and breaded shrimp. Industry cooperation in the development of these standards has been marked.

Interest centers around research on new uses for fish oil and development of a quality index for fish meal. Twenty contractors are busy on segments of this research. In addition to the work at Service laboratories, a field study at a reduction plant is being conducted jointly with the industry. The effect of season, locality of capture, size of fish, processing variables, and storage conditions on the meal, oil, and condensed solubles will be determined.

Two special market-promotion campaigns were conducted to move the surplus stocks of small haddock fillets and canned tuna. Emphasis was given to increasing the use of these fishery products by institutions. A special citywide fish-promotion program was conducted in Columbus, Ohio. This was a joint trade association and Government-sponsored campaign to test the effectiveness of concentrated promotion.

Three educational motion pictures were undertaken during the year. Two of the pictures are being financed by private industry. One will show the use of outboard motors in the commercial fisheries while the other will show various methods of preparing shrimp for the table. A contract was awarded for the third film, Government-financed, which will be on the nutritional values of fishery products.

A special study on the marketing of fishery products of Florida is being conducted, under contract, by the University of Miami.

Home economists of the College Park and Seattle test kitchens presented 131 fish-cookery demonstrations to school lunchroom personnel in 17 States. Thirteen demonstrations were presented to nonschool groups.

General statistical surveys for 1953 were completed for all sections of the United States except the Mississippi River and its tributaries. Similar surveys for 1954 were started for all sections.

Issuance of monthly bulletins on landings of fishery products in Maine, Massachusetts, New Jersey, Florida, Alabama, Mississippi, and Texas was continued. Arrangements were completed for similar bulletins for North Carolina and California. Monthly bulletins were published also on domestic freezings and holdings of fishery products, production of fish meal and oil, documentation of fishing vessels, and United States foreign trade in fishery products. Quarterly reports on the yield of fish sticks and annual bulletins on the production of canned fishery products, byproducts, and packaged fish were released.

A study was started to develop means of improving the collection and publication of statistics on freezings and cold-storage holdings of fishery products. To obtain needed information on the South Atlantic and Gulf shrimp fishery, our most important fishery in value of catch, collection of detailed operating-unit and catch statistics was undertaken.

To aid in the orderly marketing of fishery products and byproducts, marketing specialists in fishing, distribution, and consumption centers collect daily production and marketing information. This information is disseminated while it is timely and current, through daily reports by the seven Fishery Market News Service field offices located in Boston, New York City, Hampton (Va.), New Orleans, San Pedro, Seattle, and Chicago. Market News "Fishery Products Reports" provide a 17-year daily record of fishery production, marketing, and price data. These reports are used extensively in the fishery industries, in conservation work, in granting loans, in supplying background data for governmental actions, in research, and in determining the economic importance of the fisheries. Keeping pace with changing marketing trends, more marketing information on consumer-packaged fishery specialties is now being collected and disseminated. Studies were begun on the marketing of fishery products in key consumption centers other than those now covered.

The monthly periodical, Commercial Fisheries Review, continued to feature articles and news of trends and developments in the fishery industries of the United States and foreign countries.

Regulatory activities and reports on fishery cooperative marketing associations were continued in accordance with the authority vested in the Department by the Fishery Cooperative Marketing Act of 1934. On June 30, 1955, there were 84 active fishery cooperative marketing associations in the United States and Alaska as compared with 81 a year earlier.

Studies were continued on fish consumption, including consumer preferences for fish sticks and breaded shrimp, increased express and railroad charges for icing shipments of fresh and frozen fish, and imports of groundfish fillets and tuna. A study of the economics of distribution of Pacific coast fish in the Pacific Coast States was begun to determine (1) marketing practices and prices of different varieties of Pacific coast fish in the major Pacific coast consuming centers, and (2) the market potential for Pacific coast fish in the Pacific Coast States. The project will survey major fish markets in California, Oregon, and Washington to determine sources of supply, marketing channels, turnover of inventories, consumer preferences, and prices.

A survey was begun also of the fishing industry's hull insurance and protection and indemnity insurance problems. Rates and premiums have reached phenomenal levels in many segments of the industry. Vessel operations on all coasts have been hampered by this condition. Recommendations resulting from the project should lead to lower insurance costs for commercial fishermen.

A nationwide survey of merchandising practices in the shrimp industry has been started, aimed at improving production, processing, and distribution of shrimp products. Efficiency of vessels, motorboats, and processing plants will be studied by qualified engineers; time and motion studies will be undertaken with the intent of reducing costs of production. Transportation, warehousing, and refrigeration problems will be studied to improve the competitive position of the shrimp industry among the food industries.

MANAGEMENT OF THE ALASKA COMMERCIAL FISHERIES

In 1954 the commercial fisheries of Alaska, administered through the Fish and Wildlife Service, yielded products with a total value of $78 million, as compared with $70 million in 1953. The salmon fisheries which accounted for 88 percent of the total were severely curtailed in certain areas by regulatory measures designed to reserve more of the stocks for the spawning grounds and thus reverse downward trends in abundance. Patrol and stream-guard coverage was stepped up to ensure the success of this program. The total salmon pack in 1954 was 3,094,753 cases, down 12.18 percent from the 5-year average.

During the calendar year 1954, there were employed in the administration of commercial fisheries 29 fishery-management biologists and enforcement agents, 268 stream guards, patrolmen, and fishery aids, and 5 seasonal employees of the Alaska Department of Fisheries. Water transportation was provided by 7 seagoing vessels, 20 boats of smaller sizes, and about 150 outboard skiffs. Seven amphibian airplanes logged 2,630 hours of flight time.

In 202 cases involving violation of the Alaska fishery laws, of which 6 cases are still pending, 286 fishermen and 1 fish buyer were involved.

In cases disposed of, 277 defendants were found guilty, 2 were acquitted, and 7 were dismissed. Fines totaled $32,035, of which $2,885 was suspended. The cases involved 21 purse seines, 99 gill nets, 6 beach seines, 5 traps, 4 halibut boats, and 1 fish buyer. Jail sentences totaled 3,422 days, of which 3,232 days were suspended. Sales of confiscated fish netted $4,929.96.

In addition to the above, 63 sport fishermen were involved in personal-use violations, 35 for snagging salmon, 14 for sport fishing for salmon in closed areas, 8 for exceeding the bag limit, and 4 others involved in combinations of the foregoing.

To determine the timing and size of the salmon runs, 25 weirs were operated in 1954; this was an increase of 1 from 1953. By area, 9 of these were operated in southeastern Alaska, 11 in central Alaska, and 5 in western Alaska. Weirs to count downstream migrants as well as migrant-sampling traps were again used to measure survival from spawning.

Pribilof Islands Fur-Seal Industry

In 1954, the Pribilof Islands fur-seal industry produced 63,882 fur-seal skins, 2,787 fewer than in 1953. The Provisional Fur-Seal Agreement of 1942 between the United States and Canada provides that 20 percent of the annual take of skins shall become the property of the Government of Canada. In 1954, 12,776 sealskins were shipped to the order of that country. In addition to skins, production on the islands included 330.5 tons of fur-seal meal and 41,396 gallons of oil. The meal and oil were sold later in the year by competitive bidding for a gross total of $53,166.

Public auctions of United States Government-owned fur-seal skins were held in St. Louis, Mo., twice during the fiscal year. On October 18, 1954, 26,590 skins were sold for $2,045,346, and on April 25, 1955, bidders paid $2,296,757 for 24,746 skins.

MAINTAINING THE INLAND FISHERIES

Major emphasis in the past year was placed on the management of waters, through close cooperation with the States, in such a manner as to obtain the greatest return of hatchery-reared fish to the creel. The Fish and Wildlife Service operated 89 hatcheries, where 24 species of fish were propagated for distribution to inland waters. The Service liberated a large percentage of these fish in waters on Federal land, near military installations and veterans hospitals, and on State-Federal management areas. The fishing pressure on game fishes continued to mount, reflecting the demands of an increasing population and a growing appreciation of the sport of fishing as a source of relaxation and recreation. Improved fish-cultural techniques were largely responsible for an increase in the weight of fish produced for stocking, and better management made possible more efficient utilization of the product.

As more information became available on the restocking needs of management areas, the production of certain species was expanded; in many instances, the production of the larger, more efficient units was increased to meet the needs of the areas concerned. The production of legal-sized trout was an important part of the program; the need for warm-water species remained high; and the maintenance of salmon runs continued to be of major importance.

Congress provided funds for initiating an improvement program at the Inks Dam (Texas) station and for continuing the construction of a new unit at Frankfort (Kentucky), as well as for repairing flood damages at the Craig Brook (Maine) station.

The lower Columbia River fisheries development program, designed to mitigate the damage caused by Federal and other dams to the salmon fisheries of the river, completed the seventh year of operation with significant results apparent. Major fishways completed in several lower Columbia River tributary streams permit adult salmon to pass upstream to many miles of spawning area heretofore inaccessible to the salmon.

Two salmon hatcheries were completed, one in Washington and one in Oregon, and other projects under construction were continued. Some 50 irrigation diversions were screened to prevent entrance and loss of young salmon.

The program of providing maximum spawning area for salmon in the lower Columbia River is producing results. Biologists have observed increased spawning activity and greater numbers of young salmon. The full results of the program will not be apparent for a number of years.

More than 18.5 million angling licenses were sold in the 48 States in 1954. This was a gain of more than 5 percent over the previous record year and 2½ times the number sold in any year before 1946. Greater numbers of legal-sized trout were produced at Federal hatcheries to maintain the stock of these popular sport fishes in areas where the pressure is so great that native stocks have been depleted. The studies on trout nutrition and the training program for trout culturists were continued at the Cortland (New York) fish-cultural station in cooperation with the State of New York and Cornell University. These activities played an important part in decreasing the cost per pound of trout produced at Federal and State hatcheries throughout the country. The increased production of trout at a number of hatcheries with expanded rearing facilities was of particular importance in the past year; the incidence of disease in trout stocks was held below normal.

Drought conditions in the central and southern regions of the country emphasized the importance of small ponds and reservoirs. Increased pond construction brought increased demand for warm-water fish to stock the ponds. Eradication of rough fish from large water impoundments and even from entire watersheds also increased the demand for warm-water fish, especially predator species. The Service received a record number of applications for bass and bluegill during the year, and the demand for pike and channel catfish far exceeded the production. In cooperation with the States, the Service stocked large impoundments in the Southwest with wall-eyed pike fry, a measure which contributed greatly to the value of the fishery. The training of warm-water fish culturists continued at the Marion (Alabama) station, and improved techniques in the control of pond weeds, fertilization, and management of rearing ponds formed part of the training program at this station.

The program of lamprey eradication in the Great Lakes is expected to make possible the restoration of the lake trout fishing through a concerted restocking effort on the part of the States, the Federal Government, and Canada. The Fish and Wildlife Service propagates lake trout at two hatcheries now, and additional facilities will be made available for rearing this species when the restocking program is fully effected.

The Branch of Game-Fish and Hatcheries has continued to employ a small staff of fishery-management biologists. The objective has been to improve fishing through the application of management techniques. Through extension-type services, these biologists have provided fishery-management guidance to numerous public agencies. The improvement of hatchery operations and fish-distribution programs has been a staff function of the biologists; their principal effort, however, has been directed toward planning and guiding cooperative fishery-development programs for waters on Federal-controlled areas. Fishery-management assistance to Federal areas—primarily Defense installations, Veterans' Administration hospitals, national forests, Indian reservations, and wildlife refuges—has been a notably popular and successful venture. Currently more than 200 Federal installations are being assisted.

Demands for hatchery fish continue to exceed the productive capacity of State and Federal hatchery systems. Hatchery production is undergoing changes to meet the requirements imposed by continuously growing sport-fishermen pressure, construction of farm and ranch ponds and great reservoirs, and development of new cooperative management areas and fishery-management techniques. To some extent, these changes are reflected in data on production and distribution, summarized in the attached tabulations.

TABLE 1.—*Fishes and fish eggs distributed: Calendar year 1954*

Species	Eggs (number)	Fry (number)	Fingerlings		Fish 6 inches or larger		Total weight fingerlings and larger	Total number fish and fish eggs
			Number	Weight	Number	Weight		
				Pounds		*Pounds*	*Pounds*	
Largemouth bass		374, 500	11, 328, 090	24, 752	15, 190	2, 274	27, 026	11, 717, 780
Smallmouth bass		522, 060	204, 220	700			700	726 220
Bluegill [1]			12, 881, 340	30, 822	8, 570	1, 381	32, 203	12, 889, 910
Redear sunfish			1, 793, 320	4, 436	40	17	4, 453	1, 793, 360
Black crappie			50	5	500	235	240	550
Channel catfish		315, 000	600, 200	3, 686	8, 470	786	4, 472	923, 670
Bullhead			260, 680	462			462	260, 680
Walleye		2, 520, 000	1, 065, 340	1, 473	20	2	1, 475	3, 585, 360
Northern pike	2, 865, 000	7, 781, 920	111, 430	469	1, 240	37	506	10, 759, 590
Cutthroat trout	860, 700		523, 680	7, 230	31, 280	4, 840	12, 070	1, 415, 660
Rainbow trout	6, 358, 380		5, 764, 600	62, 910	2, 323, 500	459, 652	522, 562	14, 446, 480
Kamloops trout			49, 940	2, 485	34, 150	2, 853	5, 338	84, 090
Beardsley trout			16, 360	38			38	16, 360
Steelhead trout			231, 630	8, 383	48, 360	6, 872	15, 255	279, 990
Lake trout			863, 100	8, 965	1, 000	32	8, 997	864, 100
Brook trout	7, 239, 500	260, 000	2, 987, 840	34, 208	929, 720	182, 988	217, 196	11, 417, 060
Brown trout	2, 884, 730		1, 984, 760	13, 617	459, 100	97, 834	111, 451	5, 328. 590
Grayling	428, 800	350, 000						778, 800
Chum salmon	500, 800	8, 527, 400						9, 028, 200
Coho salmon	556, 750	150, 940	1, 054, 720	11, 936	94, 510	6, 444	18. 380	1, 856, 920
Sockeye salmon	913, 950		3, 704, 840	20, 748	36, 150	1, 214	21, 962	4, 654, 940
Kokanee			983, 970	237			237	983, 970
Chinook salmon	20, 360, 950	298, 520	73, 564, 240	364, 147			364, 147	94, 223, 710
Atlantic salmon		87, 760	260, 750	4, 306	3, 180	264	4, 570	351, 690
Total	42, 969, 560	21, 188, 040	120, 235, 100	606, 015	3, 994, 980	767, 725	1, 373, 740	188, 387, 680

[1] Approximately 10 million bluegill, weighing 10,000 pounds, have been distributed but not recorded at the time of this report.

TABLE 2.—*Land acquired or in process of acquisition for fish-cultural stations, fiscal year 1955*

[In acres]

State and station	Acquired			Pending title conveyance
	By other than purchase	By purchase	Total	
Georgia: Warm Springs		1	1	
Nebraska: Crawford		1	1	
Oregon: Eagle Creek	600		600	
Washington: Spring Creek				6
Total	600	2	602	6

RESEARCH IN FISHERY BIOLOGY

Coastal Fisheries

Using methods developed in its 5-year study of the Atlantic coast shad, the Service was able to predict Connecticut and Hudson River shad runs within 15 and 3 percent, respectively. Recommendations for regulations to conserve these fisheries have been made through the Atlantic States Marine Fisheries Commission, and catches and spawning escapements are both increasing. With this year's investigation of the Edisto River in South Carolina, surveys of all the major Atlantic coast shad streams have been completed.

New fish facilities at Holyoke Dam on the Connecticut River have proved successful. After a century's absence, shad in subtantial numbers this year reached their ancestral spawning grounds above the dam, with a total of almost 5,000 counted through. Design of the fishways was a cooperative enterprise of the Service and the Holyoke Water Power Co.

The Service has continued to act as coordinator of the Atlantic coast cooperative striped bass program, in which 10 States now participate. Greatest progress has been in identifying stocks of the fish; current work covers continuation of stock identification, plus studies of spawning, migrations, and life history.

To find the reason for poor survival of Atlantic salmon in recent years, biologists are making a thorough study of environment in the Sheepscot River and its estuary in Maine. It has been found that the river exerts but slight influence on its lower estuary, indicating the importance of marine climate to estuarial survival of Atlantic salmon.

A new method of evaluating brood size has been developed to improve forecasts of Alaska pink salmon abundance: The young salmon, newly migrated to salt water from their natal streams, are enumerated as seen in the many fish traps along the shores. This method should prove much more accurate than the counts at stream mouths formerly used, since much of the widely fluctuating marine mortality has already occurred by the time salmon are big enough to be found in traps.

Encouraging results have been obtained from the experimental fertilization of a small lake (Bare Lake) on Kodiak Island, Alaska, to increase red salmon production. The 1955 downstream migration of young red salmon was the largest on record, and the fish were longer and heavier than those of previous years.

Activities related to the International North Pacific Fisheries Commission have extended the investigation of the marine life of the salmon. Five research vessels (*John N. Cobb*, *Paragon*, *Mitof*, *Memento*, and *Starling*) operated by the Service, by charter, and by contract to the University of Washington, are covering thousands of square miles of North Pacific Ocean in the vicinity of the Aleutian Islands and the Alaska mainland, in a study of distribution, abundance, and identity of oceanic stocks. Samples for comparison with high-seas fish are being taken along the coast from the Aleutian Islands to the Columbia River.

In the Columbia River, electrical means of guiding salmon safely over dams are being further developed. The first crude field-scale models of electrode arrays are being refined to increase the precentage of fish guided and to decrease mortality. Electrical devices to kill predatory fish, or to keep them out of critical areas (like hatchery release points) have been proved feasible and are being further developed.

At Bonneville Dam a research facility to solve salmon fishway design problems is being built in cooperation with the United States Army, Corps of Engineers. This structure will provide a flume 24 feet wide, 24 feet deep, and 104 feet long, for the solution of biological problems of fish passage through full-scale fishway models.

Shellfisheries

Clam investigators in New England continued to apply major effort to the problem of the predatory green crab, cause of the decline in soft-clam production. On the advice of biologists, towns in Massachusetts and New Hampshire built clam fences this year.

Studies of hard clams (quahaugs) in Rhode Island showed a decline in abundance last year, and efforts are being made to find the cause.

Oyster investigations in the New England, Chesapeake Bay, and Gulf of Mexico areas continued to supply needed information to growers. With funds available under the Saltonstall-Kennedy Act, new studies of oyster predators were started to develop techniques of eradication or control. Part of this work is being carried out by contract with universities and State fishery agencies.

Inland Fisheries

The Great Lakes Fisheries Convention was ratified by the United States and Canada in June 1955, and the Commission may be operating within the next year.

Control structures operated up to June 30, 1955, indicate that the adult sea lamprey population in Lake Superior has more than doubled since 1954. Abundance in Lakes Huron and Michigan continued to be high.

In a 4-year search for methods to control the sea lamprey in the Great Lakes, electrical and mechanical devices have been developed that are economical and effective in blocking spawning runs of adult lampreys.

In search for chemicals lethal to larval lampreys but innocuous to fishes, about 5,000 compounds have been tested and 8 show promise. Their toxicity is under study to determine their margin of safety to aquatic animals; field tests will follow.

The research vessel *Cisco* completed fishery-limnological surveys of southern Lake Michigan in November 1954, and began a similar program in northern Lake Michigan in May 1955. These surveys permit a comparison of the present stocks of fishes and the present ecological structure with those of 1930–31 when the last survey was conducted. The lake trout is nearing extinction in Lake Michigan. Only 7 lake trout were taken in 1½ million linear feet of gill net in April and May of 1955; in 1930–31, 16,200 were taken in the same amount of net. The commercial chub catch increased from about 2 million pounds in the early 1940's to 11 million in 1953.

The probable source of the virus infection of blueback salmon that caused serious losses in hatcheries the last few years was the viscera used in the diet. The viscera were eliminated from the diet in the 1955 rearing season and no virus disease appeared. Experiments are under way to make viscera usable as a cheap hatchery food.

Studies on bacterial diseases of fishes are being continued by Service microbiologists and histopathologists. Several diseases have been identified; new methods of treatment are being tried, and several new drugs appear promising. Search for disease-resistant strains of trout is under way at Leetown, W. Va.

The Service is continuing the fishery research on Yellowstone Lake, in Yellowstone National Park, one of the most productive lakes in the United States, famous for its wonderful black-spotted trout (cutthroat) fishing. For several years the average catch per angler and the average size of the fish became progressively smaller. This decline accompanied increase in the number of park visitors, with consequent increase in fishing pressure. More than 200,000 people fish the lake each year; in addition, large native populations of pelicans, ospreys, cormorants, bear, otter, etc., feed largely on fishes of Yellowstone Lake.

Studies begun in 1950 have revealed that the trout population is composed of a number of separate races, each of which spawns in a particular stream. Depletion falls heaviest on a few races because anglers have concentrated at two points on the lake. Exeprimental regulations were placed in effect, shortening the fishing season and lowering the creel limit. In addition, trout eggs and fry were no longer collected at the lake for shipment to nearby States; instead, all fish were allowed to spawn naturally.

Several years' study will be required to measure how much the regulations affect abundance. Early results indicate that the decline has stopped. Studies will also be undertaken to determine the factors that make Yellowstone Lake extremely productive; if these can be determined, it may be possible to improve the productivity of other bodies of water.

Marine Fisheries

The regulation requiring a minimum mesh of 4½ inches in the cod ends of otter trawls fishing for haddock on New England banks has proved highly successful. Large-mesh nets are releasing baby haddock precisely as had been predicted on the basis of experiments by the Woods Hole, Mass., laboratory. Furthermore, they have proved so efficient in capturing larger sizes of fish that they have found wide acceptance in the fishing industry. The International Commission for the Northwest Atlantic Fisheries at its 1955 annual meeting recommended extending regulation of mesh size to Nova Scotian and Newfoundland banks. The 1952-year class of haddock has proved to be highly successful, and 3-year-old haddock are now abundant on Georges Bank. This year class will provide an excellent opportunity to test the conservation benefits of the 4½-inch mesh, since large numbers of this group should have escaped capture during the 1954 season.

With funds provided under the Saltonstall-Kennedy Act, research was begun on Atlantic herring, yellowtail flounder, whiting, and sea scallop; research on ocean perch (redfish) was expanded. Initial studies have shown that small whiting will escape unharmed through meshes of a cod end of trawl nets; conservation of this species will be possible through the use of nets with the proper mesh.

Atlantic-coast menhaden studies were commenced under the Saltonstall-Kennedy program. The menhaden is the object of the largest fishery in America. Biologists have been stationed at the main fishing centers to obtain information necessary for determining the success of annual broods. First results from surveys indicate that menhaden are shore-bound fish which require the environment of the bays and inshore waters along the Atlantic coast.

Two years of cruises along the South Atlantic coast by the research vessel *Theodore N. Gill* were concluded in December 1954, and this vessel was transferred to Maine for herring investigations. Analysis of data on numbers of fish eggs and larvae indicates that the most productive areas south of Cape Hatteras are on the inner shelf adjacent to mouths of rivers.

Studies of the red tide along the west coast of Florida were continued. Field surveys revealed the presence of *Gymnodinium brevis*, the red tide organism, in low numbers through the winter of 1954-55. Experiments show that copper in concentrations of .05 parts per million is lethal to *G. Brevis* and is the best known control chemical now available. Experiments in the laboratory, where *G. Brevis* is now maintained in culture, show that a delicate balance between sulfur compounds and copper may be the key to red-tide outbreaks in Florida waters.

Shrimp research in the Gulf of Mexico has been expanded through the Saltonstall-Kennedy program. Initial studies on shrimp tagging and a study of shrimp anatomy are under way by contract with two Gulf universities.

Analysis of data collected by the research vessel *Alaska* on cruises in the Gulf of Mexico indicates that carbohydrates are sometimes more concentrated below 200 meters than at the surface, and that photosynthetic activity probably takes places at those dark depths; this suggests that an abundance of fish might occur there.

A change of sea conditions caused the Pacific sardine to spawn in greater numbers off California than in several years. About 230,000 tons of fish (2.3 billion individuals) were off southern California during the 1954 spawning season. The increased abundance resumes a pattern that had been interrupted for at least 2 years.

Anchovy larvae were more abundant in waters of California and Mexico in 1954 than in earlier years. The 1953 and 1954 year classes of anchovy appear to be partially successful. Pacific mackerel larvae were in southern California waters in greater numbers than in recent years and the partial return of this species parallels that of the sardine.

A census of the California gray whale was taken from Point Loma and La Jolla, Calif., as the whales passed southward to Baja California lagoons to calve and breed. The estimate was 4,500 whales.

Records of Japanese fisheries operations and the Pacific oceanic fishery investigations fishing show that when fishing is poor at the longitude of Christmas Island, better fishing is to be had to the east or west. This suggests that Central Pacific yellowfin tuna stocks move about in response to changes in the environment. On the average, the vicinity of Christmas Island supports the densest population of yellowfin. The average distribution of yellowfin has been found to agree with distribution of animal plankton.

Studies of the identity of tuna stocks of various parts of the Pacific suggest that along the equator yellowfin are relatively nonmigratory. This is an important factor in determining effects of fishing on Pacific tuna stocks.

Initial surveys of the albacore of the North Pacific, started under the Saltonstall-Kennedy program, have been completed. In the fall of 1954, large numbers of small to medium sized albacore were found associated with the transition between the sub-Arctic and North Pacific waters. Albacore were found in considerable numbers in the area between 180° and 160° W. and 30° to 37° N. during the winter and spring months although they were not in sufficient abundance to support an American commercial fishery.

MANAGEMENT OF WILDLIFE

Again this year the game-management program of the Service emphasized cooperation with the States. This coordinated effort involved both the technical phases aimed at better understanding of the biology of migratory birds, and public relations and public education to strengthen support of the regulatory program.

This year 17 States participated in an enlarged waterfowl-banding program in Canada; this compared with 11 States last year. Banding is essential to a clear understanding of the migration patterns of waterfowl, and information from banding will soon permit more definitive regulations. The extremely favorable water conditions in Canada, which permitted a bumper crop of birds, lessened the opportunities for a thoroughly effective trapping and banding program; but a great deal was accomplished, particularly in the Maritime areas where for the first time a sizable banding program was initiated.

Our cooperative ties with the States were strengthened by a series of May and June meetings of technical and administrative personnel in all 48 States as they are represented in the Flyway organizations. In these meetings across the country the regulatory program of the Service was reviewed well in advance of the August meeting at which regulatory revisions for the current year are proposed.

During the year, 207 cases involving violations of the Alaska game law were concluded, in addition to 5 cases involving the Migratory Bird Treaty Act and 2 of the Migratory Bird Hunting Stamp Act which were disposed of in Alaska. Fines aggregated $18,412 (of which $2,403 were suspended); jail sentences totaled 1,862 days (of which 1,802 days were suspended). Seizures included 43 firearms, 73 traps and snares, 16 game birds, 254 fishes, 80 game animals, 36 skins of fur-bearing animals, 2 shotguns, 1 net, 1 ax, and 1 knife, and 68 hunting and fishing licenses.

In addition to the violation cases concluded in Federal courts, United States game management agents (acting as deputy State game wardens) individually, or in cooperation with State game law enforcement officers, assisted in the apprehension and conviction in State courts of 5,485 persons charged with violations of State game and fish laws, resulting in imposition of fines and costs aggregating $148,345.66. Of these cases, 2,971 involved the unlawful taking of migratory birds and interstate shipments of game animals and fish which were subject to prosecution in Federal courts under applicable Federal laws.

Game management agents of the Service continued to cooperate extensively with law-enforcement officers of other Federal agencies and State agencies in fish and game resource conservation. An example of this type of cooperation is the assistance by a Service agent to rangers of the National Park Service in the apprehension and prosecution of 8 individuals for taking overlimits of trout in Yellowstone National Park, resulting in fines aggregating $270. In Louisiana a Service agent, with State law-enforcement officers, assisted the United

States Forest Service in apprehending 5 individuals and obtaining conviction in Federal court for hunting and possessing deer on a Forest Service game management preserve during closed season. Fines and sentences aggregated $600 and 300 days in jail (of which 180 days were suspended), and 15 years' probation. In other actions, 18 persons were apprehended for transporting firearms within the preserve; 9 were convicted in Federal court, resulting in fines aggregating $900, suspended jail sentences totaling 540 days, and 45 years' probation. Of the rest of these cases, 8 were declined prosecution by the United States attorney because of extenuating circumstances and 1 case was pending at the end of the fiscal year.

A Service agent cooperated with officials of the Bureau of Customs at Miami, Fla., in the recovery of 44 spotted-breasted orioles which had been allowed entry without realizing that they were one of the numerous species protected by the Migratory Bird Treaty Act. These birds had been shipped from Nicaragua and were intended for the caged-bird traffic. No action was taken against the importer since he apparently had acted in good faith and had been misled through misrepresentations by the exporter. The birds were repossessed and donated to a municipal zoo.

At the end of the fiscal year the following most common migratory-bird permits were in effect: Propagating 3,414; scientific collecting, 1,641; bird banding, 3,588. Individual actions involving the issuance of new permits, renewals, cancellations, revocations, and amendments in connection with these permits and others, excluding bird-banding permits, totaled 3,492.

During calendar year 1954, 10,223 ducks and 1,762 geese were sold by permittees for propagating purposes; 14,252 ducks and 575 geese were sold for food; and 16,534 ducks and 777 geese were liberated. On December 31, 1954, migratory waterfowl involving a total of 50,498 of all species were being held in captivity for propagating purposes. Reports from permittees revealed that 724 wild doves and 83 band-tailed pigeons were being held for experimental breeding purposes. For scientific puropses, 17,318 migratory birds, 18 sets of eggs, and 2,275 eggs not in sets were collected. Although permittees are allowed to collect specimens of migratory birds and their eggs for scientific purposes, the permits require that all specimens which can be preserved shall ultimately be donated to a scientific or educational institution.

Under regulations pursuant to paragraph 1518 of the Tariff Act of 1930, as amended by the act of July 17, 1952 (66 Stat. 755, 19 U. S. C. sec. 1001, par. 1518), 18 permits were issued to authorize the entry, under quota, of skins bearing feathers of certain species of foreign wild birds. Imports were as follows: Pheasant skins, 4,000; gray jungle fowl skins, 2,470; mandarin duck skins, 101. The skins of gray jungle fowl and mandarin ducks were for use in the manufacture of artificial flies for fishing while the pheasant plumage lawfully may be used for millinery as well as for fishing flies.

TABLE 3.—*Cases disposed of in Federal Courts (exclusive of Alaska) involving violations of wildlife conservation laws administered by the Fish and Wildlife Service, fiscal year 1955*

	Pending July 1, 1954	New cases	Pending June 30, 1955	Terminated	Fines and costs	Jail sentences (days)	Probation (days)
Migratory Bird Treaty Act	127	1,093	266	[1] 954	$50,909	1,649	18,250
Migratory Bird Conservation Act	21	41	13	[2] 49	760	420	7,665
Migratory Bird Hunting Stamp Act	11	32	8	35	1,240	360	12.775
Lacey Act	3		1	2	2,000		
Black Bass Act	2			2	1,600	60	730
Northwest Atlantic Fisheries Act	8	2	5	5	430		
Halibut Act	1	2		3	650		
Upper Mississippi River Wild Life and Fish Refuge Act		3		3	75		
Assault Act		9	5	[3] 4			
Total	173	1,182	298	1,057	[4] 57,664	[5] 2,489	[6] 39,420

[1] Of the 954 cases involving violations of the Migratory Bird Treaty Act terminated in Federal courts during the fiscal year, 765 represent convictions resulting in fines, costs, and jail sentences as reflected under the appropriate column headings, 2 were closed because of the deaths of the defendants, 25 defendants were adjudged not guilty, 41 were dismissed, 8 were disposed of without prosecution following a warning by the United States attorneys, and 113 were closed without prosecution because of insufficient evidence or extenuating circumstances which warranted withholding of prosecution.

[2] Of the 49 Migratory Bird Conservation Act cases terminated, 24 represent convictions resulting in fines, costs, and jail sentences as reflected in the appropriate column headings, 2 defendants were adjudged not guilty, 17 cases were closed without prosecution because of insufficient evidence, and 6 cases were nol prossed.

[3] These cases were closed without prosecution because of insufficient evidence.

[4] Includes $425 suspended.

[5] Includes 2,133 days suspended.

[6] Includes 365 days suspended.

WILDLIFE RESEARCH

Wildlife research is of necessity a continuing program. New useful facts are still to be learned about all species; old ideas need constant reappraisal to assure continued effectiveness under changes brought about by a rapidly increasing human population. Superficially, studies of the same species year after year may seem repetitious; actually, promising leads for investigation are seldom wanting, so diverse are the contacts of wildlife with human activities.

Public land-management agencies are seldom free of wildlife problems that, according to interagency cooperative agreements, should have the attention of Service research biologists. In the Pacific Northwest, direct seeding of Douglas-fir and other conifers offers the main hope for perpetuating great forest industries, but woods mice and other small rodents, by eating the seeds, are blocking reforestation. In the search for a satisfactory repellent, hundreds of chemicals have been tested, and more than 40 research scientists in almost as many organizations contributed valuable tree seed, experimental chemicals, manpower, equipment, and even funds, to support the project centered at the Wildlife Research Laboratory in Denver. In Oregon a population of deer mice is being studied intensively in a logged, burned, and poisoned Douglas-fir area to determine the effectiveness of control measures.

Direct seeding is similarly important in southern pine forests from Virginia to Florida and east Texas, but here birds migrating into the area in large numbers and eating newly planted seeds have caused many failures. For the past 3 seasons Service biologists have cooperated with foresters of the Southern Forest Experiment Station to study bird repellents. During the unfavorable 1954–55 longleaf-pine planting season in central Louisiana, each of 3 chemical treatments protected seedlings in direct-seeded plots while untreated plots were severely damaged by birds.

Repellents to reduce blackbird depredation in rice, corn, and other crops are being investigated, but for the present the use of frightening devices and a change in plant varieties or planting time have given most relief. The rope firecracker in particular has often provided economical protection. Wholesale blackbird reduction advocated by some whose crops are damaged is impracticable because of the tremendous range and numbers of the various blackbird species. Local reductions may prove feasible if data now being accumulated show depredations to be mainly from resident flocks.

Repellents that will keep rabbits, deer, rodents, and other wildlife from damaging not only direct seedings but forest plantations, orchards, shelterbelt plantings, and agricultural crops are important alike to farmers, foresters, and wildlife managers. Recent laboratory and field tests demonstrated the value of several new compounds. Field tests in the Northwest showed 30 to 87 percent of untreated Douglas-fir seedlings were damaged. Similar success was achieved in the Plains States with Chinese elm and other tree and shrub species used in game-cover and shelterbelt plantings. Although these tests give cause for optimism in some cases, in others, costs of application may be prohibitive. In Montana, reforestation difficulties center around the preference of deer, squirrels, mice, hares, and other animals for ponderosa pine over less valuable tree species. By eating seeds, cutting cones, nipping seedlings, and in other ways, these animals can prevent pine predominance in timber stands, thereby causing serious economic loss. In the Lake States, similar problems occur; in the Northwest, bears girdle maturing Douglas-fir trees; countrywide, porcupines are the bane of foresters. In extensive areas, repellents seem to have little to offer. On the other hand rodent repellent treatments for packaged goods, a subject of tremendous interest to food producers and handlers, show promise. Commercially prepared boxes have been made for field evaluation, and some of the compounds have been incorporated in electrical insulation, plastics, and fabrics, a program being supported by the Quartermaster Corps.

Insecticides are used at the rate of some million tons a year, and some of them affect wildlife adversely. Tests at the Patuxent Research Refuge showed that although ill effects were not apparent from feeding small, nonlethal doses of DDT to quail for a period of several weeks, reproduction was markedly reduced and chicks from these test birds failed to survive even though fed no DDT. In a different phase of the insecticide story, mosquitoes are exhibiting a growing resistance to DDT and related insecticides and consequently are giving impetus to the drainage of wetlands as a control measure; this in turn conflicts with waterfowl-conservation efforts. Cooperative studies with the Department of Agriculture and several State agencies are under way to gather biological information as the first step in resolving such conflicts.

Loss of waterfowl breeding and nesting grounds makes imperative the improvement in quality and productivity of remaining marshes. Waterfowl habitat research has been concentrated on (1) controlling weedy marsh plants, and (2) managing water supplies better. Small-scale tests with new herbicides and adjusted water levels have shown methods by which cattails, reeds, and needlerush may be controlled. These methods applied on a large marsh in Delaware have helped to convert it into one of the most attractive areas for waterfowl on the north Atlantic coast, and similar demonstrations are being arranged elsewhere through State cooperation.

Of particular interest in marsh management is the nutria (*Myocastor coypus*), a large rodent imported from South America for its potential value as a fur bearer. A cooperative study with the Louisiana Wild Life and Fisheries Commission provides information about molting and priming of the fur, relationships to muskrats and other marsh dwellers, and effects on marsh vegetation.

Other fur-animal investigations have dealt mainly with sea otters and fur seals, particularly the food habits of these animals as they relate to commercial fisheries. Canadian, Japanese, and United States representatives at a meeting in Tokyo in November 1954 completed a joint report of the investigations made in 1952 in the North Pacific of the distribution and food habits of fur seals. In 1954, on the Pribilof kill fields, where chances of taking stomachs containing food were less than one in a thousand, 27 were obtained. The contents, 94 percent of which was the sandfish *Trichodon*, contained no commercial fish species except 2 small cod. In June 1955, a study was begun of the pelagic feeding habits of the seals with particular reference to the salmon gill-net fishery.

Mortality of fur-seal pups from hookworm is appalling, amounting in 1954 to nearly double the 63,882 animals taken for pelts. To reduce this loss a soil treatment to kill hookworm larvae is being sought. A 5.5-acre test of creosol and cresylic acid compounds decreased the number of larvae, but pup mortality was not appreciably reduced. A smaller test of 3 borax compounds was made, but effectiveness will not be known until the summer of 1955.

Under current policy the number of bull seals spared appears adequate to maintain a high ratio of pregnancy among sexually mature females. Even so, a study of the age and reproductive condition of 607 females from rookeries and 625 from hauling grounds showed that about 20 percent of the females bear their first pup in their sixth year.

A project to reestablish sea otters in former habitat made doubtful progress when 19 survivors out of 28 captured on Amchitka were released at Otter Island in the Pribilofs on April 9, 1955. Of these, 3 succumbed in the ice-packed waters. The fate of the remaining 16 should be known this summer.

Addition of a permanent investigator and several seasonal assistants gave impetus to avian botulism research, at Bear River in Utah and Tule Lake in Oregon. No major outbreaks occurred in 1954, but studies of hospitalization practices, limnobiology, and detection of toxic areas, as well as bacteriological tests of *Clostridium botulinum*, type C, continued in cooperation with the Rocky Mountain Laboratory, Public Health Service. Continued research on Canada geese at Pea Island Refuge revealed that the gizzard worm is a serious hazard to their survival there. Infective larvae of this parasite have been identified, and their period of development into an adult state in goslings has been found to be as short as 14 days. Infections of gizzard worms and flukes, which were thought to take place only on breeding grounds, were found to occur at the refuge during the winter. At Patuxent Research Refuge, where *Trichomonas gallinae* infections in mourning doves have been higher than in previous years, the susceptibility of native birds other than doves to this parasite is being tested.

Bird banding is yielding more and better information essential to the realistic management of important migratory game birds. About 176,000 birds were banded during the year, with special attention to migration of the mallard and mourning dove. Research continued on the effects of hunting and other depletion factors on dove populations. To learn more about the habitat necessary to support breeding and wintering waterfowl, intensive studies of environment and food supply were conducted in the Chesapeake Bay area. A technique of censusing woodcock by recording the calling males under measured and uniform conditions in sample areas is being tested in cooperation with 238 State and university biologists in 16 States and 3 Canadian Provinces. A method of measuring fluctuations in Wilson Snipe populations also is being studied.

An important accomplishment in wildlife literature was the issuance of Wildlife Abstracts, 1935–51, a 435-page book which annotates publications abstracted in Wildlife Review, Nos. 1 through 66. As the only compendium of the kind in the wildlife field, it should prove helpful to all organizations and individuals concerned with wildlife management and conservation.

The Cooperative Wildlife Research Units, which the Fish and Wildlife Service, the Wildlife Management Institute, land-grant colleges, and conservation departments of 16 States and Alaska operate as partners, continued their program of research, training, and conservation education.

During the 1953–54 school year, 202 wildlife students, including 71 with advanced degrees, were graduated. More than a fourth went into military service; 15 percent returned to school for further training; others obtained positions with State and Federal conservation agencies or educational institutions. Since the units were established, more than 2,200 wildlife majors have been graduated from the unit schools, and many have advanced to key positions in the field.

Research was conducted by unit personnel on waterfowl, fur and game animals, habitat improvement, and many other phases of wildlife management. Results of completed projects were summarized in 129 publications which received wide distribution. These, together with lectures, radio and TV broadcasts, and hundreds of letters written in reply to requests for wildlife information, provided facts useful both to wildlife technicians and the public.

MAINTAINING THE NATIONAL WILDLIFE REFUGES

Although there has been little in the way of direct appropriations for acquisition and development of new refuge areas since 1940, the Service has continued to make some progress in expanding the refuge system, largely through the use of suitable areas acquired by other Government agencies for other public purposes.

In the past, refuges were superimposed on 23 reservoir projects of the Bureau of Reclamation, 5 projects of the Corps of Engineers, 2 of the Tennessee Valley Authority, 2 of the Bureau of Indian Affairs, 1 of the State of Tennessee, and 1 of the South Carolina Public Service Authority. Recently, the 204,000-acre Stillwater National Wildlife Management Area was established in Nevada on lands of the Truckee-Carson irrigation district, while the 141,000-acre Loxahatchee National Wildlife Management Area was created on lands controlled in part by the central and south Florida flood control district.

During this fiscal year, the 10,800-acre Kirwin National Wildlife Management Area in Phillips County, west-central Kansas, was established on a Bureau of Reclamation impoundment. This is the first Federal refuge in that State. The Kirwin Management Area is strategically located in the Central flyway, lying between the refuge areas of western Nebraska and the famous Salt Plains National Wildlife Refuge of north-central Oklahoma. Both ducks and geese will utilize the area, although management for geese will be of primary importance because of the critical habitat situation for these birds in the Central flyway. It is expected that the Kirwin vicinity will become one of the best waterfowl shooting sections of Kansas. Under the provisions of a cooperative agreement signed last year, the Service assumes responsibility for the development of the recreational aspects of the area. Access roads, parking facilities, and picnic areas with tables, fireplaces, and comfort stations will be provided. Permits will be granted for boat rental and sale of bait to fishermen. Camping and trailer parking will be permitted.

A smaller refuge, in a critical area where land prices prohibited acquisition, was received as a gift to the Government. Mrs. Elizabeth Alexandra Morton Tilton of Southampton, N. Y., donated 112 acres of land at the eastern end of Long Island for establishment of a national wildlife refuge. A sandspit connects the refuge with the Long Island mainland. The property faces richly vegetated shoal waters which serve as an excellent feeding area for waterfowl.

Some land was purchased with Duck Stamp funds for two new refuges. An initial tract of 1,440 acres was secured in Stafford and Rice Counties, Kans., for the Quivira National Wildlife Refuge. In LaSalle Parish, La., 5,199 acres at the northeast end of Catahoula Lake will form the foundation of the Catahoula National Wildlife Refuge.

During the past 15 years this Service has been negotiating with the Corps of Engineers for the transfer of jurisdiction over wildlife on lands acquired by the corps within the limits of the Upper Mississippi River Wild Life and Fish Refuge. This area, extending for 284 miles along the river from Wabasha, Minn., to Rock Island, Ill., contains 197,444 acres in four States, and was established by act of Congress on June 7, 1924. Because of the extent of the area to be included, the limited funds appropriated for acquisition were expended only for tracts that owners were willing to sell. When the Corps of Engineers was authorized to establish the navigation project, the Service had purchased a number of scattered holdings along the river. Few of these were sufficiently consolidated to be satisfactorily managed for waterfowl. By agreement with the Corps of Engineers, the Service discontinued acquisition of lands with the understanding that the remaining lands to be acquired would eventually be made available to the Service for wildlife purposes, in return for which Service lands would be available to the corps for navigation purposes.

Inasmuch as it would have been economically infeasible and unnecessary to prohibit hunting on the acquired lands within the exterior boundaries of the Upper Mississippi Refuge, public hunting was allowed except in areas where there were sufficiently large blocks of land to serve as closed areas. Some of these units were selected wholly on the basis of size, regardless of their suitability for waterfowl management, and have so existed for many years. It was only recently that these negotiations were consummated and that the Fish and Wildlife Service has been in a position to select the better areas for intensive waterfowl management.

The Service is farming 98,925 acres to raise food for the hordes of ducks and geese that frequent the refuges. At certain times of the year about one-half of the continent's waterfowl population is dependent on these areas. During one period in December 1954, a total of 850,000 geese and 2,845,000 ducks were concentrated on three national wildlife refuges, one State refuge, and several hunting-club areas in the Sacramento Valley of California. To feed these birds and guard against their damaging adjacent ricefields, Service personnel in 1954 planted 2,441 acres of rice, millet, and barley, which produced over 100,000 bushels, on Sacramento. Colusa, and Sutter National Wildlife Refuges.

In addition to this vital function, the national wildlife refuges are a haven for picnickers, hunters, fishermen, photographers, and bird watchers. More than 5 million persons visited the refuges in 1954. Parts of 32 waterfowl refuges, with 527,207 acres, were open to shooting that year. Some of these were large areas like Tule Lake and Lower Klamath National Wildlife Refuges in northern California, Bear River Migratory Bird Refuge in Utah, and Upper Mississippi River Wild Life and Fish Refuge. In addition, 34 refuges with 2,100,000 acres were open for big-game and upland-game hunting. Bow-and-arrow hunting is gaining in popularity and was permitted on 10 refuges. The first archery season on wild turkey occurred on Bulls Island, within the Cape Romain National Wildlife Refuge in South Carolina, last year.

Waterfowl for tomorrow and continued opportunities for hunting them present a real problem. There were 25 percent more duck hunters during the past 5 years than during the 5 years preceding. If the duck populations hold out and if places to hunt remain available, provision will have to be made for 4 million duck hunters by 1975, or almost twice the present number. There are two great destructive forces now besetting the waterfowl resources—on the one hand the number of hunters and on the other the accelerated destruction of waterfowl habitat in public and private ownership. Waterfowl habitat is being destroyed faster than conservation agencies can restore it.

The most effective method found for combating habitat loss is increased use of suitable lands on refuges for intensive crop production to feed ducks and geese. Other benefits to existing habitat are being secured through the eradication of pest plants, such as cattail, saltcedar, and noxious weeds. This work entails the use of aircraft for spraying and reseeding, power and hand spraying rigs of various types, and mechanical equipment for cutting or removing noxious plants. Loss of habitat through fire continues as a problem and reached disastrous proportions early in 1955 on the 329,110-acre Okefenokee National Wildlife Refuge in southern Georgia. A 3-year drought created an extremely serious condition in the swamp. In 1954, loss of 42,516 acres of timber resulted from 11 fires, 10 of them caused by lightning. Fires this year burned over 65 percent of the swamp with varying degrees of intensity. The policy, followed by the Service since acquisition of the area in 1937, of maintaining the swamp in a completely hands-off and natural condition, must now be relinquished to provide higher water levels. A much more effective fire-control organization, embracing the refuge and surrounding land, is now being organized.

The national wildlife refuges are constantly threatened by encroachments of various kinds. One group or another wants to take over or use the refuges for some kind of special or selfish interest. Expansion of military establishments has involved several refuges. A military public works bill included authorization for expansion of Fort Sill by transferring 10,700 acres of the Wichita Mountains Wildlife Refuge in southwestern Oklahoma. This area includes several lakes and one of the most intensively used recreational sections of the refuge. In 1954, more than 850,000 persons visited Wichita Refuge.

Military use on several other areas has been worked out under memorandums of understanding, with little damage to the refuges or disturbance to wildlife.

TABLE 4.—*Land acquired or in process of acquisition for wildlife conservation purposes under the Migratory Bird Conservation Act, by exchange, and by other acts of Congress, fiscal year 1955*

[In acres]

State and refuge	Acquired			Pending title conveyance
	By other than purchase	By purchase	Total	
California:				
Salton Sea				3
Sutter				118
Colorado: Monte Vista				1,157
Florida:				
Chassahowitzka		16,887	16,887	
Loxahatchee		1,327	1,327	
St. Marks		18	18	
Sanibel		100	100	
Georgia: Piedmont		243	243	
Idaho: Deer Flat	280	59	339	80
Kansas: Quivira				1,440
Kentucky: Reelfoot				250
Louisiana: Catahoula				5,199
Maine: Moosehorn				1
Maryland: Martin	2,482		2,482	
Michigan: Shiawassee		2,961	2,961	94
Minnesota:				
Rice Lake		136	136	160
Upper Mississippi				404
Mississippi: Noxubee	1,934		1,934	603
Missouri: Mingo		14	14	
Montana:				
Fort Peck	43		43	
Red Rock Lakes	1		1	
New Jersey: Brigantine				48
New Mexico: Bitter Lake	80		80	
New York:				
Morton	112		112	
Wertheim				8
North Dakota:				
Lostwood		490	490	
Tewaukon		492	492	1,333
Oklahoma: Salt Plains		80	80	
Oregon:				
Cold Springs	280		280	
Malheur		2,686	2,686	1,670
South Carolina:				
Carolina Sandhills				51
Santee				72
Savannah				5
Texas: Laguna Atascosa		2,278	2,278	970
Vermont: Missisquoi				750
Virginia: Chincoteague				25
Washington:				
Columbia		185	185	41
Turnbull		5	5	
Wisconsin:				
Horicon		60	60	
Upper Mississippi	54	97	151	
Total	5,266	28,118	33,384	14,482

TABLE 4.—*Acres of public domain reserved for wildlife conservation purposes and administered by the States*

State and unit	Acres
Arizona: Gila River	6,8[illegible]6
Colorado: South Platte River	120
Idaho: North Lake	2,392
Utah: Topaz Lake	3,[illegible]2
Washington: Colockum	3,[illegible]95
Total	16,765

FEDERAL AID TO STATES FOR THE RESTORATION OF FISH AND WILDLIFE

Wildlife Restoration

For the 17th consecutive year, the cooperative wildlife restoration program continued to pay a key role in the Nation's wildlife conservation efforts. Financial support for the program, from the excise tax on sporting arms and ammunition, amounted to $10,266,257, a decrease of 15 percent from last year. Federal funds carried over enabled the net obligation by the States and Territories of $11,153,472 in 706 projects. Improvement of wildlife habitat continued to be the principal interest. Studies to gather additional knowledge of wildlife management received substantial attention, as did acquisition of wildlife areas, maintenance of completed projects, and coordination of programs at the State level.

Reflecting the increasing interest in waterfowl restoration, every State undertook development of waterfowl areas last year to create nesting, feeding, or resting areas. Eight States performed construction work to create small marshes for ducks, while others worked on areas ranging up to 18,000 acres. Nineteen States, using captive goose flocks, are engaged in establishing or reestablishing goose concentrations where feeding and resting areas have been developed for these birds. Eleven States combined fisheries and wildlife restoration funds to create impoundments that will benefit both fish and waterfowl.

Habitat improvements for farmland wildlife such as rabbits, quail, and pheasants were carried out on private lands through cooperative agreements in 36 States. The trend toward quality rather than quantity continued. Manipulation of the habitat in forested areas increased deer browse and furnished herbaceous food in scattered patches, together with openings for grouse and turkeys. Activities included selective logging on private and public forests, reseeding browse and forage plants, fencing, and construction of access roads and trails.

Trapping and transplanting efforts were concentrated mostly on moving deer and wild turkeys into suitable but vacant ranges in the South. The State of Oregon secured 20 of the rare California bighorn sheep from British Columbia in an effort to restore this subspecies. Thousands of wildlife watering devices have been installed in the arid States and Hawaii to overcome local moisture deficiencies. Six of these installations in Nevada were found to be watering a population of 2,800 Gambel's quail where none had been present before.

During the year, 72,500 acres were purchased and 145,000 acres leased for wildlife purposes by 32 States. Primary emphasis was on big-game ranges and management areas for forest and upland small game species. More than 8,800 acres were acquired in combination fish and wildlife projects.

Wildlife investigations were conducted in 45 States. Of those States, 38 emphasized collection of data on wildlife populations, production success, and harvest results to serve as the basis for annual hunting regulations. Waterfowl research stressed breeding-ground and winter populations surveys, migration studies, and hunter bag checks. Appraisals of the effectiveness of restoration activities for waterfowl and upland forms received attention in 40 States.

Revegetation of big-game winter ranges, particularly in the West, has posed many problems. Eight States engaged in studies to speed up the conservation of useless brushlands and overbrowsed ranges to productive range lands. Much progress has been made as a result of these studies. For example, bitterbrush, an important source of food for big game on western ranges, can now be reseeded successfully as a result of seed treatment that ensures early germination.

The publication of results is imperative if the interested public, administrators, and wildlife managers are to profit from project findings. During the year, 389 articles, bulletins, and books were published on the results of Pittman-Robertson activities.

Fish Restoration

Funds for the Dingell-Johnson program, from the excise tax on sport-fishing tackle, permitted the apportionment of $4,532,800 to the States, Alaska, Hawaii, Puerto Rico, and the Virgin Islands. Funds carried over from the preceding year enabled net obligations to reach $4,692,000, an increase of 30 percent over last year. The number of projects undertaken by the States showed a pronounced rise, from 301 to 372. For the first time in program history, physical development and habitat improvement projects exceeded research activities in the amount of funds obligated. Scientific investigations continued to occupy a prominent spot in the program, however, with nearly $2 million obligated for urgently needed fact-finding activities.

In fishery development, the creation of public fishing lakes continued to receive major attention. Construction was carried out on 28 areas where 3,250 acres of fishing waters will be impounded to expand presently inadequate fishing facilities. Elimination of undesirable fish populations by chemical treatment was conducted on 30 lakes by 13 States. Fishing of high quality will be assured following restocking in nearly 17,000 acres of lakes and 370 miles of stream. Access roads and other improvements to make waters available to fishermen were under construction in 16 States and Alaska.

Stream-improvement and watershed-development projects were financed in 7 States. The activities included erosion control, such as streambank protection, gully stabilization, fencing and tree planting, channel development, removal of log and rock barriers, and construction of fishways.

Twenty-one States purchased land for public fishing lakes and for access by anglers. Nearly 2,700 acres were acquired and an additional 56,000 acres have been leased for fisheries projects. More than 8,800 acres have been bought for combination fish and wildlife projects.

Perhaps the most notable trend of research activities in the fisheries field was the widespread interest in testing partial population poisoning to perfect and evaluate it as a fish-management tool. The method consists in water treatment with a toxic chemical in such a dilution that only undesirable fish, like shad and stunted panfish, are affected. Improved growth by more desirable species and increased angling success have followed most applications of this technique.

Surveys to produce information on fish numbers, species, and growth rates, and on water conditions in lakes and streams continue to occupy a prominent place in the program. Reservoirs also are under examination because of their importance as public fishing waters and because management techniques must be devised to ensure maximum production from these waters if they are to absorb their proper share of the Nation's sharply rising angling pressure.

A number of projects provided for detailed study of individual species of fish, mostly those that helped to give prominence to the fishing possibilities of an area but which subsequently declined in abundance. Creel censuses and fish population studies are under way, along with experiments in fish culture and stocking. Marine problems are the concern of a growing list of fishery projects on the Atlantic and Pacific coasts.

RIVER BASIN DEVELOPMENT AND WILDLIFE NEEDS

Of 265 reports this year by the Service on water developments planned by Federal agencies or by other interests under Federal permit, 102 were on Corps of Engineers projects, 55 on Bureau of Reclamation, 14 on Department of Agriculture, 52 on power projects requiring license from the Federal Power Commission, and 42 were special and miscellaneous studies.

Two important agreements were completed during the fiscal year. The first of these, with the Corps of Engineers, is designed to promote conservation of fish and wildlife resources in the development of flood-control, navigation, and multiple-purpose projects. The second, with the Soil Conservation Service, sets procedures for encouraging the coordination of fish and wildlife conservation with soil and water conservation works carried out by local organizations with Federal assistance as provided by the Watershed Protection and Flood Prevention Act of August 4, 1954.

In September 1954 the International Association of Game, Fish, and Conservation Comissioners, representing the 48 State fish and game departments, adopted a resolution requesting the Fish and Wildlife Service to arrange for a nationwide economic survey of hunting and sport-fishing activities. The Service contracted with Crossley, S–D Surveys, Inc., for a survey of hunting and fishing expenditures by sportsmen during 1955. This will be the first nationwide survey of this nature. The results will be published after completion of the survey in June 1956.

In line with the Coordination Act of 1946, plans were completed this year for the use of six reservoir areas for wildlife management. Lands have been made available to the State conservation departments at Garrison Reservoir and Lake Ashtabula in North Dakota, Willow Creek Reservoir in Colorado, Conemaugh Reservoir in Pennsylvania, Angostura Reservoir in South Dakota, and Cedar Bluff Reservoir in Kansas. In addition, a Federal refuge has been established at Kirwin Reservoir in Kansas, and one is planned for part of the Snake Creek arm of Garrison Reservoir. At Garrison, after extensive negotiations, the Corps of Engineers initiated development of wildlife habitat to compensate for part of that flooded by the reservoir.

The inventory of wetlands completed last year has been enhanced by a followup inventory of permanent water areas. Together, these surveys provide the most comprehensive summarization ever compiled of habitat available to waterfowl and other wetlands wildlife. Individual State reports are available for limited distribution, and a national summary is being prepared for publication. These data provide the background for a nationwide wetlands habitat preservation program now under way. The program has been designed to discover conflicting interests in wetlands use and to determine how these may be reconciled and how the impact of land-use changes detrimental to wildlife may be reduced.

Other important actions relating to water developments include the start of construction by the Bureau of Reclamation of a fish hatchery at Nimbus Dam in California to compensate for the loss of salmon spawning beds, and passage of a law expanding purposes of the Central Valley project in California, to include use of project waters for fish and wildlife purposes. The joint Federal-State surveys of the Arkansas-White-Red Basins and the New England-New York area were completed, and special studies were begun on the relation of fish and wildlife to specific major power projects in Oregon, Washington, and Idaho. Other studies were pursued on fish and wildlife resources in certain Alaskan watersheds and in the Rogue River Basin of Oregon, and on the impact of dams on the striped-bass fishery of the Roanoke River in North Carolina. In connection with the proposed Garrison irrigation project in North Dakota, particular attention has been given to the protection of existing national wildlife refuges and to potential fish and wildlife developments.

CONTROLLING DAMAGE BY ANIMALS

The fiscal year 1955 was the 40th of Federal participation in organized predator and rodent control in cooperation with State, county, municipal, and other organizations. As in the past, farmers, ranchers, sportsmen, and other groups were benefited by techniques evolved over the years. Control is necessary not only to prevent losses to livestock and crops, but also to suppress outbreaks of rabies and other diseases spread by wild animals.

Major effort was devoted to the continuation of long-established projects for the protection of livestock, poultry, and game from predatory animals, particularly coyotes and bobcats. While many instances of predation upon sheep, goats, calves, and domestic fowl occurred during the year, prompt action prevented these losses from reaching serious proportions. For example, although heavy storms in the Sierra Nevadas of California in January 1955 caused a downward drift of coyotes into the San Joaquin Valley, hunters stationed in the area were able to catch most of the animals, and losses to wintering bands of sheep and to 2½ million turkeys, raised on valley ranches, were less than during the previous year.

In several of the Western States, control work was handicapped by drought, fluctuations in livestock numbers, and reduction in cooperative funds for the employment of field personnel. In Utah, particularly, the hunter force was inadequate to prevent a buildup of coyote populations. Experience indicates that such conditions are costly, since losses through increased predation are much greater than the temporary savings from reduced expenditures. Predator control in Alaska was carried out on a reduced scale during the year. Satisfactory increases in the once depleted Nelchina and Peninsula caribou herds were attributed largely to earlier wolf-control measures by the Service. Emphasis was shifted to protection of caribou and reindeer in the Arctic range and other big-game species in southeastern Alaska. The latter activity was partially financed by the Territorial government.

Field employees assisted the public in the control of various species of rodents and other small mammals. Native mammals that fed upon agricultural crops in various sections of the country included jack rabbits in Idaho wheatfields, pocket gophers along Arizona irrigation canals, cotton rats in South Carolina watermelon fields, moles in urban lawns, white-footed mice in west-coast reforestation projects, and tree-girdling mice in New England orchards. Rising costs of labor and materials intensified the need for more efficient procedures. This problem was partially solved for fruit growers by perfection of a mechanical device for poisoning mice in apple orchards.

Little change occurred in the high postwar level of rabies outbreaks among wild animals. Whereas the trend was downward for dogs, cases reported for wildlife increased from 311 in 1944 to 1,694 in 1954. Countywide projects to control rabid foxes were carried out in parts of Virginia and North Carolina after 7 persons were bitten and 37 rabid foxes were killed over a 2-month period. Similar outbreaks, with resultant losses to livestock, took place in many States, particularly in the Southeast and in California. During the past 2 years, 6 kinds of bats have been found to be carriers of rabies. The role these bats play in spreading the disease to other animals is as yet unknown.

It is recognized that, owing to control measures, the extent of damage encountered in many other parts of the world no longer occurs in this country. For example, recent famine conditions in several Philippine provinces were largely the result of 90-percent loss of rice crops to rats. Several countries plagued by such wildlife-damage problems requested help during the year. Canada, Mexico, the Union of South Africa, the Philippine Islands, and Caribbean areas were assisted in combating losses caused by animals, ranging from wolves in the Arctic to rats and mice in the Tropics.

American food industries were confronted with domestic rodent problems aggravated by surpluses of wheat, corn, and other cereal grains.

At many storage sites rats and mice increased in numbers, consumed or contaminated much of the product, and infested surrounding communities. Service personnel assisted the dried-fruit and grain-handling industries in combating such situations. They participated in numerous meetings and community rat and mouse control projects as part of a current nationwide grain-sanitation program sponsored jointly by industry and government. The first two developed anticoagulant rodenticides, warfarin and pival, were widely used in control operations, and there was reduced demand for the more hazardous, highly toxic chemicals. As a result of this trend, the manufacture of Compound 1080 was discontinued. Extensive field tests with a new anticogulant rodenticide, fumarin, were made in Texas, Louisiana, and Mississippi.

Cooperative predator and rodent control operations during the year entailed expenditures of $935,924 from regular departmental appropriations, supplemented by $1,321,572 from cooperating States and $2,952,978 from cooperating counties, livestock associations, and others. The recorded catch of predatory animals by Service and cooperative personnel was 55,204 coyotes, 2,658 wolves, 19,249 bobcats and lynxes, 874 stock-killing bears, and 195 mountain lions. In rodent control operations, 10,554,715 acres of land were treated for elimination of prairie dogs, ground squirrels, pocket gophers, jackrabbits, field mice, cotton rats, kangaroo rats, porcupines, woodchucks, and moles. In addition, 418,671 premises were treated in cooperative campaigns for the control of rats. Special equipment and supplies used in both predator and rodent control, and 337,193 pounds of rodent-bait materials, were distributed by the Service's supply depot at Pocatello, Idaho.

INTERNATIONAL COOPERATION IN CONSERVATION

International Technical Cooperation

The Fish and Wildlife Service continued to cooperate closely with the Foreign Operations Administration in technical assistance to friendly nations. Fishery development projects were carried on in Mexico, El Salvador, Peru, Ecuador, Bolivia, Liberia, Iran, Pakistan, India, and Indonesia. On January 15, 1955, employees of the Service assigned abroad under this program were transferred, with minor exceptions, to the Foreign Operations Administration. The Service assists the Administration by providing technical information, recruiting competent technicians, and supervising the instruction of foreign students in the United States.

In India, mechanization of small boats has increased production by cutting down the running time to and from the fishing grounds. Special motor and railroad vehicles permit the rapid transport of fresh fish to inland areas. In addition to the usual fishing near shore, purse seining in more distant waters has been done experimentally. This kind of program in India should help to increase the present low per capita consumption of 4 pounds per annum, compared with 16 pounds in Ceylon, and 70 pounds in Burma.

The fishery terminal planned for Karachi, Pakistan, has been approved, and construction will begin soon. A dual-purpose vessel is being put into service to do exploratory fishing with trawls and purse seines. In Indonesia, the effectiveness of longline fishing for tuna has been demonstrated, and a start has been made in exploring for large shrimp resources. The number and extent of the islands of this archipelago present a great problem and a greater opportunity for fishery development. In Latin America, projects continue in Peru and El Salvador, but the one in Mexico was terminated at the end of the fiscal year.

In many parts of the world there is opportunity of developing inland waters, to make fresh fish available near the points of principal need. A program of development recently begun in Liberia has attracted great interest among farmers, and it is expected that the number of ponds will be multiplied many times in the next few years.

The training of foreign students in the United Sates continues to be an important part of the technical assistance program. This year, 26 students from 12 countries received training in 7 branches of fishery science and technology. Four students came from Latin America, 4 from the Middle East and Africa, and the rest from countries of Southeast Asia, principally Indonesia and Thailand. From time to time, reports are received on the activities of trainees who have returned to their home countries to put into practice the newly acquired knowledge and skill. To ensure lasting benefits, these technicians must assume responsibility for the continuation of projects initiated by American experts.

International Conservation Agreements

During the fiscal year 1955, the Service was concerned with the activities of several international fishery conservation organizations, as well as two major international conferences.

As a result of a new International Pacific Halibut Convention and subsequent changes in the management of the halibut fishery, the catch in the summer of 1954 broke all records, producing approximately 71 million pounds of fish, a gain of 11 million pounds or 18 percent over the preceding year's catch.

The International Pacific Salmon Fisheries Commission also produced striking results. The 1954 catch from the sockeye salmon runs of the Fraser River system exceeded by far any runs since the organization of the Commission.

The International North Pacific Fisheries Commission held its first annual meeting in Vancouver, British Columbia, in October 1954, and adopted a research program. This program has been accepted in substance and is being implemented by the three Governments—Japan, Canada, and the United States.

The International Commission for the Northwest Atlantic Fisheries held its fifth annual meeting in Ottawa in June 1955. Possibly the most important of its actions was a recommendation, to the member governments, of regulations limiting the size of meshes to be used in the trawl fisheries for haddock and cod on the Nova Scotia and Newfoundland Banks. A similar regulation for Georges Bank and the Gulf of Maine has been in effect approximately 2 years and has benefited American fishermen at the rate of about a million dollars a year.

The International Whaling Commission held its regular annual meeting in Tokyo in July 1954, when it reviewed statistics on the catch of the previous season and adopted a number of significant changes in its regulations.

The Inter-American Tropical Tuna Commission, composed of representatives from the United States, Costa Rica, and Panama, continued its research on the tunas of the eastern tropical Pacific Ocean. This research has not yet reached the stage where it is possible to speak definitively, but there are indications that some of the tuna stocks are being exploited at a rate above that which will permit maximum sustained yield.

The Indo-Pacific Council held no meeting during fiscal year 1955. Its sixth annual meeting will be held in Tokyo in September 1955, when work of the past 18 months will be reviewed and plans laid for future work.

Officers of the Service were members of the United States delegation to the United Nations International Technical Conference on Conservation of the Living Resources of the Sea, in Rome in April 1955. This conference, possibly the first of its kind, brought fishery experts from some 50 nations in an attempt to find ways to cooperate in ensuring maximum production from important marine resources. The report of this conference was submitted to the International Law Commission of the United Nations, which met in Geneva in May and June 1955.

Officers of the Service were also members of a United States delegation which, with representatives of Canada, signed a Convention for the Great Lakes Fisheries on September 10, 1954. The Convention was ratified on June 6, 1955. Under its terms a Commission will be established to bring under control the parasitic sea lamprey which has damaged the Great Lakes fisheries in recent years, and to promote and coordinate investigation of those fisheries.

THE NATIONAL PARK SERVICE

Conrad L. Wirth, *Director*

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THE past year has been marked by numerous events and developments of such interest and importance as to make it one of the truly noteworthy years in the history of the National Park Service.

Two major events are closely related to each other. The 1955 appropriation provided for the first real increase in seasonal personnel in many years; it made funds available for a long start on an overdue road-and-trail construction program; and, by matching a $500,000 donation for land acquisition, and at the same time continuing the established $250,000-a-year land purchase item, it made a total of $1,250,000 available to speed up the Service's land program.

These increases are gratifying, but they do not solve the problems of the National Park System, nor will they if continued at their present rate. The System is truly a national asset of major importance socially and economically; it is one of the most important "identification marks" of a free people. The fact that, for one reason or another that may have seemed justified at the time, the System has been allowed to deteriorate because of necessarily lowered standards of maintenance, protection, and development has caused serious national concern. This, coupled with our efforts to obtain increased appropriations, on a yearly basis, to correct the situation, has convinced us that we must approach the problem differently; that we must prepare and submit a sound, long-range, economical, one-package program to meet future needs as well as to cure current bad conditions.

This has led to the undertaking to which the name Mission 66 has been attached. This is an all-out attempt to evaluate every practice of the Service and all of its administrative and development planning; its purpose is to formulate a program which, if followed, will see the National Park System adequately developed and adequately staffed by 1966—the 50th anniversary year of the establishment of the Service.

Defense against unsuitable developments.—Deeply gratifying to the Service has been the intense interest in MISSION 66 shown by Secretary McKay, Assistant Secretary Lewis and others in the Department. Equally gratifying have been the evidences of the Department's determination to protect the character of the areas of the National Park System. Secretary McKay's decision against the proposal for construction of a tramway up the side of Mount Rainier and down to Crater Lake; departmental approval of the Director's refusal to permit construction of a television tower atop Scotts Bluff; and the Secretary's opposition to the Glacier View Dam project, in Glacier National Park, and to proposals to reduce the size of Olympic National Park—all these exemplify his and the Department's attitude.

New region approved.—With the establishment of an additional region, Region Five, scheduled for July 1, 1955, the reorganization of the Service, begun nearly 2 years ago, has reached virtual completion. Congressional doubts as to the necessity of adding a region and even of continuing Region One were dispelled by a careful restudy of the Service's existing regional setup by a special departmental committee. The Appropriations Committees of both House and Senate readily agreed to the budget request for funds with which to operate a Region Five office in Philadelphia. The reorganization is showing excellent results.

Concessions.—The year was also notable with respect to certain park concessions developments. One of these was the purchase by Fred Harvey of all Santa Fe Railroad interests in the services provided visitors in Grand Canyon National Park, to be followed by modernization and expansion of South Rim facilities, where they are much needed. Another was the completion of Jackson Lake Lodge at Grand Teton National Park, constructed with funds supplied by Jackson Hole Preserve, Inc., a nonprofit distributing corporation established by John D. Rockefeller, Jr. A third was the decision against providing lodgings of any kind at Flamingo, in Everglades National Park, and to count upon private enterprise to furnish these outside the park, as has been done at Great Smoky Mountains National Park.

Study of interpretation.—For more than 30 years, the interpretation phase of the National Park Service's work has steadily gained in extent, effectiveness, and public acceptance. Since the establishment of a Division of Interpretation, as part of the Service's reorganization, there has been intensified effort to increase the effectiveness of the interpretive program. In the belief that it would tend to strengthen and give better direction to this program, a 2-year study and appraisal of interpretive activities carried on by the Service and by other public and private agencies is being undertaken by Freeman Tilden, who is especially well qualified for such a study. It is being financed by an anonymous donation.

Operations Division.—Organization of the Division of Operations was completed with the establishment of a Branch of Conservation and Protection, headed by a chief with long and varied field and Washington office experience. This branch, which embraces sections on forestry and on maintenance, gives all matters related to park protection definite representation in the Washington office for the first time.

Rockefeller benefactions.—The donation of $500,000 for land acquisition, to match the same amount of appropriated funds, was made by Jackson Hole Preserve, Inc., the nonprofit corporation established some years ago by John D. Rockefeller, Jr., to finance various undertakings in park conservation. The corporation also financed the construction of the new Jackson Lake Lodge, in Grand Teton National Park, and the purchase of lands for a prospective Virgin Islands National Park on the island of St. John. Direction of the corporation's affairs lies largely in the hands of Laurance Rockefeller, who shares his father's deep interest in the national parks.

Publicity.—The growing and more intelligent interest in the national parks and their welfare has been indicated during the past year by an exceptionally large number of magazine and newspaper articles and editorials. These, as a rule, have called public attention to the vastly increased visitor load on the National Park System, and to the handicap of inadequate development and insufficient staffing, and they have urged increased appropriations to meet the Service's needs.

Coastal studies.—Financed by anonomously donated funds, the Service was nearing completion of a 2-year study of the Atlantic and Gulf coasts, undertaken to discover the most distinguished areas along these coasts which remain in relatively unspoiled condition. The findings of this study should be of interest and concern to the Federal Government and to the various State and local governments, since beaches and related coastal areas possess high value for active recreation as well as unique scenic, scientific and historical values; considerable enlargement of public holdings of such property is greatly needed. Donated funds are also making possible the thorough study, launched during the year, of the geology and history of the Cape Hatteras National Seashore.

Personnel.—Printed and spoken tributes to the high quality of the men and women employed by the Service continue to be numerous. Aware of their devotion, and the exacting demands made upon them by the requirements of their work, the Service has labored with marked success to upgrade those whose responsibilities warranted it. The positions of 115 superintendents and those of a number of other employees have been advanced in grade during the past year. This long overdue improvement has been a great help to the morale of the Service.

Assembly Room at Independence Hall refinished and refurnished.—When the General Federation of Women's Clubs held its convention in Philadelphia in May, the Service was proud to display the refinished and refurnished Assembly Room of Independence Hall to its president and many of its members, as a finished part of the project which is to be extended to the entire first floor of the structure. This work is being financed by a gift of about $210,000 raised by the federation and presented to the National Park Service. At ceremonies preceding the convention a Donors' Book was presented to the Director who, in turn, presented a special citation to the federation for its splendid accomplishment.

Benefactions.—The National Park Service has reason to feel deep gratitude over the extent to which it has benefited during the past few years from the foresighted generosity of individual, corporate, and foundation donors to various phases of its work. The year 1955 has been especially notable in this respect, as may readily be gathered from the preceding paragraphs and elsewhere in this report. The many contributions bear witness to the wisdom of the Congress in having authorized the Donation Fund in 1920 and the National Park Trust Fund in 1935.

A limited distribution of "The Fifth Essence," which describes the work and some of the problems of the Service and indicates some of the fields of activity which would benefit from benefactions, has produced much favorable reaction which it is hoped may result ultimately in enlargement of the National Park Trust Fund. This year there was wider distribution of the book to foundations, to trust officers of banks, and to numerous persons of means. A member of the Director's staff has been given the responsibility of following up on "leads" and devising means of interesting possible donors in contributing to the fund.

MISSION 66

For some years it has been apparent that use of the National Park System has outrun its capacity, as presently planned and developed, to meet the demands on it. Travel has increased to the point of embarrassment, while provision for it and for better protection of both the parks and those who use them has been deferred again and again because of lack of funds. Since 1941, appropriations for management, for protection, and for development have lagged seriously behind the need for them occasioned by greatly increased public use. The System, designed for 25 million visitors a year, is now called on to bear a load that is twice that heavy. One result has been a flood of publicity, most of its sympathetic, some of it frankly critical, calling attention to the dilemma of the National Park System.

The only solution is to formulate and carry out a sound, overall program of improvements. Piecemeal efforts are not enough. At the same time, the attention given to these problems by this publicity encourages confidence that such a program will receive public acceptance.

Planning for today and the immediate future, and construction on that basis, can lead only to future embarrassment and to renewed demands for more of everything. We must "back off" and take an objective look at the National Park Service and what it is doing; appraise the effectiveness of its policies of protection and use; and determine what, and where, additional development is actually needed, in the long view. Above all, we must scrutinize the way things are done, having in mind the most efficient use of limited manpower and funds.

Such a comprehensive study of every phase of the National Park Service's responsibilities has been launched, under the designation of MISSION 66. Its objective is to prepare today a program that will fit park operation and development to the needs of 1966 and that will permit such further development as the years thereafter may require without the necessity of radical changes. This is a doubly fitting goal; a 10-year forecast is about as far as a reliable plan can be projected, and 1966 is the 50th anniversary year of the establishment of the National Park Service. It is our goal that by 1966 the plans being made now will have been carried out, and travel, development for visitor needs, and park protection brought into proper harmony.

To achieve this goal, the MISSION 66 steering committee and its staff began with a review of past plans, files, and records to permit consideration of all previous proposals for changes in development plans and operation methods.

While these materials were being examined, all employees in the field and at various headquarters offices were encouraged to envision an ideal situation for those areas with which they were intimately acquainted, and to put their ideas in writing. Many suggestions of great value to improve park protection, park use, and park management have resulted.

It is assumed that provision must be made for a 60 percent increase in visits over 1955, for a total of 80 million. On this basis, we are developing plans to insure continuing protection of the important features of each area, and to provide facilities required by visitors, as well as a full staff for management, protection, and maintenance.

For guidance in developing the MISSION 66 program, all policies and procedures have been carefully examined. Wherever necessary, they are being restated to fit a modern world in which increased leisure is expressed in greater automobile and air travel, and in new ways of handling various problems of operation. These revised "precepts," calling attention to important park problems, place protection in first priority, but indicate that proper development is the key to good protection, and that visitor use is the best possible protection against encroachment.

The location of administration offices, warehouses, shops, and residences was studied, and it was decided that they should be separate from areas used intensively by visitors. Many parks and, in some instances, important portions of parks can best provide visitor appreciation through day use, rather than overnight use. Traffic problems require solution by modern methods; for example, some alternative must be provided for the huge open parking spaces now required. These suggest the kinds of problems being faced, and some of the possible methods of solution.

In some situations, without question, Federal and State properties adjoining the parks will be called upon to provide some of the space and some of the services required to meet the needs of park visitors. Expansion of the recreational facilities of the national forests and of State parks and forests will help materially in supplying expanding public recreation requirements. We expect to expand our cooperation with the proper sister agencies to this end.

Committees in the field areas and in the Regional and Design and Construction offices are also working on the program. It is, in fact, a servicewide effort, with boldness in thinking the key to the endeavor. The final report on MISSION 66 will present the problems, and the solutions recommended for them; it will require legislation and this will be ready for the consideration of the second session of the 84th Congress. It is the dream of park administrators that, with the support of the Department, MISSION 66 will result in getting done what needs to be done if the parks are to fill their highest purpose in the modern American way of living.

INFORMATION AND INTERPRETATION

The National Park Service's interpretive and informational activities reach millions of persons who make use of the areas administered by the Service and who share in the ownership of this priceless part of our national heritage. These persons are seeking a clearer and deeper understanding of the natural and human history of their country and of the interrelationships of man and his surroundings exemplified in the National Park System, and an informed appreciation of what we, as Americans, possess and that strong pride in it which we call patriotism.

This part of the Service's work presents a constant challenge to make every phase of it more useful to our visitors; to seek out and use every improved technique that our means permit; to find men and women best qualified to engage in it; and to provide them adequate, stimulating training.

Reorganization completed.—Reorganization of the Division of Interpretation was completed with the filling of the four regional chief of interpretation positions and through adjustments within the branches in the Washington office. Establishment of a Photographic Section in the Branch of Information, to program and coordinate servicewide photographic activities, was a major change; the branch's Public Information Section was also reorganized and strengthened.

Visitor services grow.—A definite index of the extent of the Service's interpretive activities is found in the figures showing the number of persons served by three major phases of the program. A total of 2,138,592 visitors participated in guided trips; audiences at talks, lectures, campfire and similar programs totaled 3,969,084; while 13,724,301 persons made use of such interpretive facilities as museums, historic houses, and other attended exhibits.

Written and telephoned requests to the Washington office alone for publications during the second half of the fiscal year increased about 45 percent over the corresponding period of 1954, yet were met with reasonable promptness without increase of staff. A new Eastern United States map, showing Service-administered areas and containing essential information about each (a companion of the Western United States map produced last year), made it possible to meet most of these requests much more economically from the standpoint of number of publications required, postage costs, and speed of processing.

Regional training conferences for both protection and interpretive personnel were held at St. Augustine, Fla., and Rapid City, S. Dak., last spring and were an important step toward more effective visitor services. Issuance of the revised Manual of Information and Interpretation in the Field and of three new training-aid booklets—Guided Trips, Campfire Programs, and Information Please—contributed materially to better results in both informational and interpretive work.

Publication production at high level.—The Editorial Section of the Branch of Information was without the services of a chief during 9 months of the year; nevertheless the program was carried through successfully and efficiently. In addition to the production of so-called free publications, the year brought notable additions to the Service's sales list. New historical handbooks produced included those for Fort Laramie National Monument and Vicksburg National Military Park;

manuscripts for Bandelier and Ocmulgee National Monuments and Kings Mountain National Military Park went to the printer. In addition, pending the production of handbooks for Appomatox National Historical Park and Fredericksburg and Spotsylvania County National Military Park, the 16-page booklets for these areas were revised and reissued. The archeological research series was enlarged by the appearance of No. 2, Archeological Excavations in Mesa Verde National Park, Colo., 1950.

Natural history handbooks for Badlands National Monument and Rocky Mountain National Park, Nos. 2 and 3 in this series, were also produced during the year. Revision of the long popular tree preservation series advanced with the production of No. 1, Transplanting Trees and Other Woody Plants, and the submission to the printer of No. 4, Shade Tree Pruning, and No. 7, Rope, Knots, and Climbing. This series, produced primarily for guidance in the care of the many shade trees growing on historical areas administered by the Service, has been in steady demand since issuance of the original edition in the late thirties.

Starting with the Sequoia and Kings Canyon National Parks booklet, revision of all national parks information publications is planned, to be accomplished in 4 years. This involves rearrangement of material, adoption of a more friendly, person-to-person tone in the writing, and adoption of a new and handier format. To as great a degree as possible, other publications have been given such rearrangement and modification of tone, without major revision.

For the maps which are to be included in the revised national parks publications, the Service is availing itself of the expert cartographic services of the Geological Survey.

During the year, 110 requisitions were issued for the printing of 7,462,000 copies of informational publications, each dealing with a single area, 6 for revised or new sales publications, and 19 for plate changes in sales publications, and for other miscellaneous publications, such as the constantly useful leaflet, National Parks and National Forests.

In addition to their services in providing books, equipment and other materials to strengthen the interpretive programs of those areas in which they operate, natural history associations and other cooperating societies continue to supplement the Service's publications program. Several distinguished new publications issued by the societies reflect the Service's effort to assist them in improving these in both content and appearance.

New aids to visitors developed.—The employment of a field naturalist with responsibilities in Regions Two, Three, and Four has greatly accelerated the efforts to integrate new interpretive facilities with current construction programs. This applies, thus far, particularly to construction at Mount Rainier, Olympic, Grand Teton, and Grand Canyon National Parks and at Wupatki and Sunset Crater National Monuments.

There was a healthy growth in the number of self-guiding trail and tour facilities, with approximately 50 devices of this type being installed. The study of self-guiding trails and tours begun last year has continued through 1955 and the second part of this study was released to the field areas for their guidance.

The Audio-Visual Committee, representing the Divisions of Interpretation and Design and Construction, tested the efficiency and effectiveness of commercially available recorders, slide projectors, and record players. Results of this research, furnished to the field, will result in considerable saving of time and money by making similar analysis by individual areas unnecessary. Near the end of the year, funds were made available for the experimental installation of three types of audio-visual equipment—electronic guiding systems, high-fidelity public address systems, and automatic illustrated program devices.

The care of exhibits.—Museum work during the year included the care of growing collections of important historic and scientific objects and the building of exhibits to help interpret the parks. Donations of exhibit materials, many of which are of great value, impose on the Service a special obligation to provide them the most complete and expert care its means will permit.

Among the objects entrusted to it for museum use was the garrison flag which flew over Fort Sumter at the outbreak of the Civil War and the storm flag, also in the fort at the time. An antique brocaded stole from the vestments of a missionary priest, perhaps as early as Father Kino himself, was given to Tumacacori National Monument. Another missionary relic with rich associations—the French-English dictionary presented to Elkanah Walker by Captain Sutter at the Whitman Mission—was given to Whitman National Monument. Exceptionally fine examples of armor, swords, pole arms, and other military equipment of the 16th and early 17th centuries were obtained with the help of generous citizens for museums at Jamestown Island, Fort Caroline, and San Juan. Acquisition of Washington's campaign tent is recorded elsewhere.

To preserve and restore the murals in the rotunda of the Old Courthouse at Jefferson National Expansion Memorial in St. Louis, a crew of art students was trained to help the staff specialist in the tedious and intricate task of reattaching loose paint, cleaning the surface, and repairing losses. Museum Laboratory specialists gave preservative treatment to collections at Chickamauga and Chattanooga National

Military Park, George Washington Birthplace, Hopewell Village, Independence National Historical Park, and Vanderbilt Mansion. Specimens from several other areas were treated at the Museum Laboratory. The branch preservation laboratory at Jamestown was fully occupied most of the year in cleaning and treating the thousands of objects being excavated there. The branch laboratory at Gila Pueblo made good progress in the safe storage and cataloging of archeological collections from Southwestern areas.

Service policy governing museum collections was carefully reviewed and a revised statement was submitted to the Advisory Board for study.

In cooperation with the American glassmaking industry, the Service, having in mind the Jamestown 350th Anniversary Celebration in 1957, began the development of Glasshouse Point. In close association with the remains of the Jamestown glassworks of 1608–24, cooperating glass companies will build and operate, as an educational exhibit, glassmaking facilities similar to those of 1608, first factory industry in English America. For the general interpretation of the Jamestown-Yorktown story, the Service made substantial progress on museum prospectuses for the visitor centers and museums at Yorktown and Jamestown, now under construction at a cost of $300,000 each.

New museums and exhibits.—New museums were opened on the Blue Ridge Parkway and at Joshua Tree National Monument. On the parkway, where the road skirts an important mining district, the State of North Carolina appropriated funds to build and install a museum of North Carolina minerals. The Service designed the building and planned and constructed the exhibits, which tell the story of how the minerals are mined, processed, and used.

A new set of exhibits was prepared for the Mountain Pioneer Museum at Great Smoky Mountains National Park to correlate with the nearby Pioneer Farmstead. Average attendance at this museum has been more than 1,500 a day during the current season.

At the Jefferson National Expansion Memorial, an extensive exhibit of ironwork was installed, mostly of architectural cast iron saved from the riverfront memorial area. Other series of exhibits were designed and installed in the lobby of the new administration building at Saguaro National Monument, the information center at San Juan National Historic Site, and the temporary headquarters at Harpers Ferry National Monument. The Museum Laboratory constructed individual exhibits for 15 parks.

A special set of displays was designed and constructed for the experimental information station installed just inside the West Yellowstone entrance of Yellowstone National Park. These tell visitors what they need to know about roads, distances, accommodations and services, and what to see and do in the park.

Wildlife.—The nationwide reduction of carnivorous animal population has resulted in certain wildlife imbalances, including excessive numbers of ungulates and rodents, in several areas. The excess of elk, beyond the capacity of available winter range, at Yellowstone has presented a serious problem, not yet solved, for a number of years. Last winter, 593 were trapped and shipped elsewhere while hunters outside the park killed 763. The combined total falls several hundred head short of the normal natural increase. At Yellowstone also 288 bison were removed; 226 of these came from Hayden Valley.

At Wind Cave National Park, with assistance from Custer State Park, 300 elk and 146 bison were removed; at Rocky Mountain National Park, 53 elk and 24 deer; at Platt National Park, 4 bison; at Sequoia National Park, 125 deer. At Grand Teton, 103 elk were shot by the 600 permittees deputized as park rangers pursuant to Public Law No. 787.

It is encouraging to note that, under effective Service protection, certain wildlife species threatened with local and, in some instances, nationwide extinction have increased in numbers. Important among these are the trumpeter swans in Yellowstone and Grand Teton National Parks, the Dall sheep at Mount McKinley, the desert bighorns at Mesa Verde, and the roseate spoonbills, manatees, white-tailed deer and alligators at Everglades. The Service is hopeful that the decline in prairie dog populations in some western parks and monuments can be arrested. Visitors find these small animals of exceptional interest.

Research.—Careful research is a necessity of both sound interpretation and proper management. The National Park Service, of necessity, must conduct a considerable amount of it in the fields of history, archeology, and natural history in order to give increasing effectiveness to its interpretive program.

The 2-year study of interpretive methods, mentioned elsewhere, gives promise of producing recommendations that will further streamline and strengthen interpretive activities. During the past year, additional visitor-use studies have been completed at Kennesaw Mountain, Acadia, Death Valley and Fort Sumter; others at Scotts Bluff and Effigy Mounds are in progress. Such studies are important for improvement of interpretive and informational facilities and for planning and management of the areas.

Numerous research projects dealing with natural history or its interpretation are completed or in progress. These include the Katmai National Monument inventory; fisheries investigations; Yosemite, Acadia and Death Valley visitor-use studies; studies of visitor impact on giant sequoias and of rabbit devastation on Santa Barbara Island; an ecological study of Big Bend; animal population and browse studies at Grand Canyon, Yellowstone, Mesa Verde, Wind Cave, Sequoia, Olympic, Isle Royale, Theodore Roosevelt and Colonial; and geological field work at Big Bend and Joshua Tree.

Some of this work is performed by Service personnel, some by or with other Federal agencies, and many through cooperative agreements with universities, State agencies, or individual research scientists affiliated with reputable organizations.

The reactivated archeological program at the site of the first permanent English settlement at Jamestown, Va., resulted in numerous important discoveries, such as the foundations of a street of row houses, a sturdy foundation as yet unidentified but possibly that of the second Statehouse of the Virginia Colony (1656–60); and the breastplate and backplate of a suit of armor and a sword of the period 1595–1610 with the name of the maker still readable on the blade. Numerous sword hilts and pieces of matchlock muskets (earliest firearms used at Jamestown) were found in association with each other at what appears to have been the Jamestown armorer's shop of 1611–25.

On the grounds of the Association for the Preservation of Virginia Antiquities, a Service archeologist excavating in and near the foundation of the third (1665–76) and fourth (1686–98) statehouses discovered 70 burials in a cemetery so old it had been forgotten by 1650. Believed to be a cemetery of the "starving time," 1609–10, a movement is on foot to honor these victims of the most trying period in the founding of Virginia. Another archeological project exposed the foundations of Royal Governor Sir William Berkeley's mansion at Green Spring, the first great English house in America.

Through cooperative agreements, archeological excavation projects were carried out by four local institutions at two reservoir sites. North Dakota State Historical Society and the University of South Dakota worked in the Oahe Reservoir area; the University of Kansas and the Nebraska State Historical Society investigated sites in the Fort Randall Reservoir area. With funds provided by this Service for the purpose, the Smithsonian Institution also carried out important archeological salvage investigations in the Fort Randall and Oahe Reservoir areas.

John White paintings of 1585–86, to be published.—Donated funds have enabled the Service to assist the University of North Carolina Press in publishing facsimile reproductions in color of the famous watercolor drawings made by John White in the Cape Hatteras area in 1585–86. Accurate reproductions of these drawings, now in the British Museum, have long been desired by American scholars.

George Washington's Revolutionary war tent purchased.—A generous but anonymous donor made possible the purchase of the tent used by George Washington all through the Revolutionary War. Used by Washington for purposes of sleeping and as a place for writing important dispatches during his campaigns, the tent has outstanding national interest for the American people. Inherited by George Washington Parke Custis, of Arlington, foster son of George Washington, the tent passed from him to his only daughter, the wife of Gen. Robert E. Lee, and was sold to the National Park Service by the Lee heirs. It will be preserved and exhibited at Yorktown, last battlefield on which Washington used it. The cover or some other memento will be placed at the Custis-Lee Mansion at Arlington.

John Marshall Bicentennial and Woodrow Wilson Centennial Commissions.—During 1955 the Director served as executive officer of the John Marshall Bicentennial Commission, established to celebrate the 200th anniversary of the birth of our greatest Chief Justice, and of the Woodrow Wilson Centennial Commission, created to commemorate the 100th anniversary of the birth of President Wilson.

Assistance to writers.—Heightened public interest in the national parks and in the needs of the National Park System has both been caused by and resulted in an unusual number of magazine and newspaper articles and editorials dealing with the System. This has meant an increased demand on the Service for data, which has been supplied as accurately and factually as possible. This evidence of interest, and of the esteem in which the Service seems generally to be held, has been heartening, as has been the unusual series of advertisements dealing with the national parks, and the conservation organizations which have worked effectively in their behalf, launched during the year by the Sinclair Oil Corporation.

Cooperative assistance.—The Service continued to work with the Department of State in connection with the International Convention for the Protection of Cultural Property in the Event of Armed Conflict, which must be ratified by the United States Senate. Professional advice in the identification or preservation of historical and military objects or other aid in the field of military history was extended to 18 different agencies of the Federal Government, 15 State agencies, and 11 private or semipublic organizations. A large piece of Spanish armor (a brigandine) of the period 1530 found near Tampa, Fla., and doubtless a relic of the De Soto Expedition, first major exploration of the North American interior (1539–43), was identified and treated.

OPERATIONS

The Operations Division, with the impetus given it by the Department's reorganization decision, has fitted well into its intended function on matters concerned with park operation, maintenance, and protection, and with control of programs for park betterment. Emphasis in both Washington and Regional office operations has been on assisting park organizations to care for the areas and to manage the use of them for the ever-growing multitudes of park visitors. Seasons of use become longer, numbers of visitors are constantly greater, and needs increase in proportion.

The Branch of Conservation and Protection has completely functioned for the first time this past year under a branch chief of wide experience selected from the ranks of park superintendents. Programing procedures have been devised and placed in operation to insure coordination of planning, financing, and expenditure for all park improvements. The needs of field areas remain in first priority in line with new concepts of management.

Travel to the parks.—Public use of the areas continued the upward trend that has been constant since 1946. Visits to all areas administered numbered some 47,800,000 in 1954 as compared to 46,200,000 in 1953. Thirteen areas attracted more than 1,000,000 each. Of these Blue Ridge Parkway recorded some 4,300,000; two other areas had more than 2,000,000 each.

Travel survey.—Further progress was made toward completion of travel surveys of certain national parks which started several years ago. These were undertaken to obtain much needed information on the travel habits and expenditures of park visitors. They are conducted in cooperation with the Bureau of Public Roads and the several State highway departments concerned. During the year both the Yosemite and Shenandoah National Parks travel surveys were published. A report on the Grand Canyon National Park survey has been prepared and is being published. Plans are being worked out with a nationally known survey organization to make an overall study of park travel trends, especially park visitor requirements and the different kinds of overnight facilities they would like to have. This will have a big bearing on our final MISSION 66 program.

Conservation and Protection

The new position of Chief of Conservation and Protection provides for the first time a definite representative in the Washington office for all matters pertaining to park protection. His duties cover a very broad field, overlapping into all phases of park management. He advises specifically on park ranger organizational and training matters, personnel adjustments, park protection problems and safety, service to park visitors, forestry, and maintenance.

Forestry.—Prevention and control of forest fires continued to receive major attention and, despite increased public use of the parks, a reduction was noted in the number of all types of man-caused fires except those caused by campers, and those from miscellaneous sources.

These last may be due to overcrowding which forced visitors to camp and picnic outside protected and developed sites. Total area burned and suppression costs were both below the 20-year average. Emphasis continues to be placed on training, organization, and preparedness. The Service again participated in the organization and training of the Organized Southwestern Indian Fire Fighters who have proved very effective. Our excellent forest fire record is due to the very well trained and organized ranger and forester staff.

White pine blister rust control work is near completion in most areas. It is probable that within a few years the only living forests of subalpine five-needle pine will be in the control areas of five western national parks, as no other agency is attempting to protect the species. A spot infestation of oak wilt disease, discovered in Shenandoah National Park, was promptly controlled.

Control work is done annually to protect the valuable trees in and near public use areas against forest insect infestations and to prevent development of epidemics. Southern pine beetle required control in Great Smoky Mountains, on the Blue Ridge Parkway, and on adjacent areas under a cooperative program. Spruce budworm, epidemic in Montana and Idaho, required spraying of 31,360 acres of Douglas-fir in Yellowstone. About 46,000 acres of lodgepole pine in Yosemite is under attack by an epidemic of lodgepole needleminer. No practical control method exists, so large losses may be expected. Efforts to devise a means of control are continuing.

A traveling crew of experts on tree maintenance worked in 26 eastern areas to maintain both public safety and the quality and appearance of the trees. They performed many emergency duties following hurricanes "Carol" and "Edna." This crew removed more than 1,300 hazardous trees during the year.

Maintenance

Under the new management concept, maintenance activities have been placed under the Division of Operations. Work accomplished has been principally in the fields of staffing, basic procedures, and fiscal adjustments. The objectives are to obtain maximum economy and efficiency in the use of all available resources for protection and use of the primary values of the national parks. Sound management and engineering principles are applied to all maintenance activities at all levels. Workload measurements have been used to justify very satisfactory increases in maintenance funds, and more such standards are being used as field data become available. Full application of this principle will provide a sound preventative maintenance program.

A series of Maintenance and Rehabilitation Guides have been issued for estimate and procedure matters. More are planned to guide the programing of preventative maintenance work. In the regional offices, the professional men in the Maintenance Branch have spent most of their time assisting area superintendents. In the larger parks, a staff of professional men has been provided to assist on maintenance problems. Emphasis has consistenly been on helping the park superintendent to carry out his full responsibilities.

The Branch of Programs and Plans Control was started as part of the reorganization of the Service and has been in operation for a little more than a year. So far it appears that development of the System will be benefited by establishment of this Branch.

Programing

Instructions for programing development were revised to fit the operations pattern established in the reorganization of the Service. Programs are now prepared and recommended to the Director by the Division of Operations; detailed data for individual project proposal forms are the responsibility of the Division of Design and Construction. This procedure is now in operation and working satisfactorily.

A card index system for individual projects has been set up which provides ready information on programing, financing, progress, and completion of any project. At the request of the Bureau of the Budget, the "Schedule of Public Works Construction Programs," required each year for the next 6-year period, was prepared in much greater detail this year than in previous years. This gives a detailed analysis of scope, character, and location of construction projects planned by the various bureaus.

The "contract authorization" for roads and trails and parkways provided by the Congress for fiscal years 1955, 1956, and 1957 required stepping up the collection of basic data, preparation of programs and surveys, completion of plans and specifications, and getting construction work started promptly. The fact that the Service was still undergoing reorganization complicated the situation considerably, but by hard work, and with the fine cooperation of the Bureau of Public Roads, most of the difficulties were overcome, and good progress was made on the obligation of funds. The Service is now ready to handle the full amount of the contract authorization for 1956 and 1957. For contract authorization, the Programs and Plans Control Branch, with the help of the Division of Design and Construction, is preparing control schedules showing anticipated cash expenditures on projects included in a 6-year program.

Data received from the field will form the basis of current estimates of amounts needed in all areas to complete development as it is presently planned. These reports will be the basis of all programing activities and issuance of information.

Land Acquisition and Water Rights

Land acquisition.—During the year $1,250,000 was made available for land acquisition. Of this amount, $500,000 was received from Jackson Hole Preserve, Inc., to match a $500,000 appropriation which was conditioned on a matching donation. Some 17,800 acres were brought into the System by purchase, donation, or exchange.

About 3,200 acres more were acquired or optioned with approximately $265,000 of the $1,236,000 donated in 1952 for the Cape Hatteras National Seashore project. Approximately 23,500 of a total of 28,500 acres in the project have been acquired.

The establishment of Cumberland Gap National Historical Park is expected within a few weeks. Fee title to 515 acres of land and scenic easements was acquired from the State of West Virginia for its portion of the Harpers Ferry National Monument project. The State of Maryland is in the process of acquiring about 800 acres as its portion of the project.

Obligations on completed purchases, option contracts, and condemnation awards come to about $6,800,000 of the $7,700,000 appropriated for acquiring properties for Independence National Historical Park project.

A good start has been made on acquisition of the extension to Wright Brothers National Memorial, for which the Old Dominion and Avalon Foundations donated $82,000 and the State of North Carolina $25,000.

Donations included 3,375 acres of land and scenic easements from the State of Mississippi for Natchez Trace Parkway; 364 acres from the State of North Carolina for Blue Ridge Parkway and 73 acres from Jackson Hole Preserve, Inc., for Grand Teton National Park.

By exchange the Service acquired 160 acres in Death Valley National Monument; 2,000 acres in Joshua Tree National Monument; 1,070 acres in Olympic National Park; 2,880 acres in fee and the mineral rights in 7,690 acres in Theodore Roosevelt National Memorial Park.

Completed purchases and approved options to purchase involve a total of 3,700 acres of land and improvements thereon, costing about $850,000, in Big Bend, Glacier, Grand Teton, Great Smoky Mountains, Kings Canyon, Lassen Volcanic, Rocky Mountain, and Yosemite National Parks; Colonial and Saratoga National Historical Parks; Gettysburg National Military Park; and Manassas National Battlefield Park. Options amounting to $300,000 awaited approval at the end of the year.

Water-rights problems.—There was continued progress in the establishment of Federal rights to the use of water through the approximately 1,445 water systems in Service-administered areas to comply with the water laws of the individual States. By appropriation or purchase or as appurtenances to acquired inholdings, the United States has established 426 rights since 1936, appurtenant to 355 water systems. Of these, final licenses or decrees have been granted for 265, and 161 are still in permit form requiring water-system enlargement or water use by the annually increasing number of visitors, before proof for licenses or decrees can be obtained. The preparation of applications, statements of claim, and purchase negotiations to establish essential rights for 315 additional water systems continues.

Only one protest of a conflicting claim was filed, and four older protests were resolved in favor of the United States. The city of Los Angeles also withdrew its Federal power application and 10 water-right applications for development of the Kings River, Calif., thus eliminating its interest in the Tehipite and Cedar Grove areas adjoining Kings Canyon National Park, and in other sites inside the park.

Special uses of park lands.—The majority of special use permits for the past year continued to be for agricultural use of small parcels of land to maintain historical and rural scenes, for access facilities from private lands to park roads, and for utility lines.

By authority granted by this Service, the Atomic Energy Commission has continued to carry out its reconnaissance surveys for strategic minerals in areas of the System. The number of requests for information on prospecting and mining in national parks and monuments increased tremendously during the past year.

Concessions Management

Twenty-four concession contracts and 27 concession permits were negotiated in the 1955 fiscal year. In connection with new contracts, construction programs were negotiated with the Everglades Park Co., Inc., for Everglades National Park in the amount of $250,000; Rocky Mountain National Park with the Colorado Transportation Co. for $244,000; Millerton Lake National Recreation Area with Mack Lazarus for $49,500; Glacier National Park with the Glacier Park Co. for $795,000; and Grand Canyon National Park with Fred Harvey for $1,000,000; Lake Mead National Recreation Area with Cottonwood Cove Corp., for $150,000, and I. H. and Janice C. Whitehouse for $235,000; and Mount Rushmore National Memorial with the Mount Rushmore National Memorial Society for $500,000—a total of $3,223,500.

Nine prospectuses issued during the year solicited offers to operate concession facilities at Everglades, Big Bend, and Mount McKinley

National Parks; Lehman Caves and White Sands National Monuments; Shiloh National Military Park; and Lake Mead National Recreation Area. As a result, concession permits or contracts were concluded at each of these areas, except Big Bend, where no offers have been received, and Mount McKinley National Park, for which the three offers received were not acceptable.

Of the construction programs negotiated this year, more than $500,000 in construction and rehabilitation has been completed, and approximately $700,000 is now under contract.

With respect to construction programs negotiated in prior years, the Grand Teton Lodge and Transportation Co. has invested more than $5,000,000 in new facilities, completed this year, at Grand Teton National Park. Funds for this construction were supplied by Jackson Hole Preserve, Inc., the nonprofit corporation established by John D. Rockefeller, Jr. Other such investments include: Babbitt Bros., approximately $85,000 at Grand Canyon National Park; the C. W. and G. Anderson Co., Lake Mohave Resort, Inc., and Temple Bar Resort, Inc., $59,500, $215,000, and $78,100 respectively, in new facilities at Lake Mead National Recreation Area; the Lassen National Park Co., over $100,000 in new facilities at Lassen Volcanic National Park; Becker's Ocean Resort, Inc., $11,000 in new cabins at Olympic National Park; Rainbow Forest Lodge, $8,500 in rehabilitation at Petrified Forest National Monument; and the Yosemite Park and Curry Co., more than $300,000 in new facilities at Yosemite National Park.

ADMINISTRATION

Budget and Finance

Appropriations.—The cash appropriations to the Service for the 1955 fiscal year were less than for the 1954 fiscal year. However, the contracting authority for construction of roads, trails, and parkways provided by the Federal Aid Highway Act of 1954 resulted in an increase in total obligational authority for 1955 over 1954. The comparative amounts are as follows:

Appropriation item	1954 fiscal year	1955 fiscal year	Increase or decrease
Management and protection	$8,869,550	$9,098,390	+$228,840
Maintenance and rehabilitation	8,300,000	8,425,000	+125,000
General administrative expenses	1,268,000	1,084,000	−184,000
Construction	13,916,300	13,618,200	−298,100
Construction (liquidation of contract authority)	1,500,000		−1,500,000
Total appropriations	33,853,850	32,225,590	−1,628,260
Construction (unfunded contract authority for roads, trails, and parkways)		10,500,000	+10,500,000
Total obligational authority	33,853,850	42,725,590	+8,871,740

Visitor fees.—In accordance with the policies set forth in Title V—Fees and Charges (Public Law 137, 82d Cong.), an extensive system of visitor fees is maintained to cover, in part, the cost of services and facilities furnished park visitors. The revenue from the fees is deposited to the general fund of the Treasury and partially offsets appropriations to the Service, thereby reducing the burden on the general taxpayer. At the request of the Secretary a comprehensive survey of visitor fees was made during the past year. This took into consideration the cost to the Government of providing the services and facilities, the value to the recipient, and the public interests served. The recommendations resulting from the survey would substantially increase Service revenue but action on them is being held in abeyance pending congressional action on proposed fees for the Blue Ridge Parkway. For the parkway the Service planned to establish a fee of $1 for a 15-day automobile permit and $2 for an annual permit. The collection of the fees was deferred at the request of the House Subcommittee on Appropriations until it could consider the proposal. It is expected that the Committee's action on the Blue Ridge Parkway fees will have an important bearing on future fee proposals.

The elevator and guide fee at Carlsbad Caverns National Park, N. Mex., was increased from $1.10 to $1.50 effective June 25, 1955, the date the new express elevator facilities were made available for visitor use. The increased revenues will amortize the capital investment made by the Government in constructing the facilities in accordance with an understanding with the congressional Appropriation Committees.

Revenues.—The Service has been losing substantial amounts of revenue for several years because it could not man entrance stations and other collection points during the full time it was productive to do so. Sufficient funds were appropriated by the Congress for 1955 to provide for 306 additional seasonal uniformed personnel. As a result of the additional personnel, the continued increase in park visitors, and upward revisions in the fee structure, visitor revenue for the 1955 fiscal year went from $3,274,997 to $3,929,496, or an increase of $654,499. A comparative statement of all park revenues for the 1954 and 1955 fiscal years is as follows:

Revenue source	1954 fiscal year	1955 fiscal year	Increase or decrease
Visitor fees	$3, 274, 997	$3, 929, 496	+$654, 499
Business concessions	493, 448	412, 702	−80, 746
Sale of property and products	142, 956	192, 778	+49, 822
All other sources	128, 498	216, 343	+87, 845
Total	4, 039, 899	4, 751, 319	+711, 420

Consolidation of field accounting offices.—The Service consolidated and reduced the number of its field accounting offices from 48 to 28 as a result of a joint survey made by representatives of the Department, the General Accounting Office, and the Service. The consolidation eliminated 24 positions and effected a savings of $92,000 which is being used for more productive field work. Each employee affected was given an opportunity to transfer to existing vacancies elsewhere in the Service. However, a few terminations were necessary.

Personnel Management

Heavy workload caused by shifts.—The most significant problem faced by the Branch of Personnel in the past fiscal year was the continuing heavy workload brought about by the reorganization of the Service. An extraordinarily large number of shifts of personnel continued to be made throughout the fiscal year, largely as a result of chain reactions set up by movements among top positions in the Regional offices and the Washington office. These shifts of personnel received a new impetus in the second half of the fiscal year in connection with staffing the new Region Five office at Philadelphia, Pa., and the 28 field accounting offices set up in lieu of a larger number of such offices as a result of a special study.

Position studies justify upgrading.—A completed project of great importance to the Service was a classification study of superintendent positions. This resulted in the preparation of tentative allocation standards for these very important positions, and resulted in upward reclassification of the great majority of them. Another completed study of considerable magnitude concerned the chief clerk and administrative officer positions, and positions subordinate to them. A large percentage of the chief clerk positions were also upgraded as a result of the study, and the title "chief clerk," which had been in use since the Service came into being, was abandoned in favor of the title "administrative officer." The superintendent and administrative officer reclassifications have improved the grade structure of the Service tremendously, have opened the way to its further improvement, and have resulted in noticeable uplift in the morale of field employees.

New handbook.—To keep all employees better informed, as well as to improve the orientation training of new employees, a completely new employee handbook was produced and distributed to all permanent employees near the end of the fiscal year.

Recruiting seasonal employees.—In the preceding fiscal year, procedures newly established by the Civil Service Commission required the recruiting of seasonal rangers through the competitive examination process. With very strong help from the Office of the Secretary, the Service obtained Civil Service Commission approval to place these seasonal positions under schedule A for recruiting purposes this year. Reports from several important field areas received by the end of the year indicate that recruitment of the seasonal uniformed staff proceeded much more efficiently, economically, and rapidly this year than was the case last year under the examination process. Although it is too early to compare the results of recruitment with the results obtained last year, early indications are that the quality of recruits is more satisfactory this year than last.

New regional directors.—Hugh M. Miller, who began his career with the National Park Service in 1931 as an assistant clerk at Wind Cave National Park, was promoted to the position of regional director, Region Three, to succeed Miner R. Tillotson, who died on February 28 after more than 14 years in that position. Miller had previously been assistant regional director. Daniel J. Tobin, whose first employment with the service was as a clerk in Sequoia National Park, and who has been assistant regional director in Region One for the past 3 years, was selected to fill the new position of regional director, Region Five, scheduled for establishment on July 1, 1955, with Philadelphia as headquarters.

Employee training.—As a means of serving the public more effectively and making more effective use of our human resources, employee training continued to receive more and more emphasis. In this connection, an experimental Washington office general in-service training course was conducted for 18 employees through a 13-week period to acquaint the participants with the activities of the various segments of the Washington office, as well as to give them greater familiarity with field operations.

The agenda for an approved preseason training program for seasonal public contact personnel was developed and distributed to the field.

The 13th general administration training course was conducted in the Region One office from November 29 to December 10, 1954, with 27 selected field employees in attendance. The 14th course was conducted in the Region Three office from April 25 to May 6, 1955, for 21 employees. A total of 341 carefully selected employees have undergone this type of intensive administrative training since it was started in 1940.

Safety

Visitor-accident fatalities.—It is considered of some importance that visitors not only enjoy and obtain the benefits of knowledge and inspiration which the areas of the National Park System offer, but also that they do so safely. For the calendar year 1954 visitor-accident fatalities were found to be in the ratio of less than one per million visitors. Motor-vehicle accidents and drownings were the leading causes of visitor-accident fatalities.

At the request of the Federal Fire Council, the Service prepared a letter to the Comptroller General which includes suggested language for use in specifications to permit all agencies of the Federal Government to purchase approved equipment and appliances based upon tests by recognized testing laboratories. The letter has been sent by the council to the Comptroller General who, in 1954, had ruled that the requirement that equipment bear the label of the Underwriters' Laboratories is restrictive.

Records Management

The Branch of Office Services has, during the past year, gained approval of and made distribution to all field offices for mandatory application a comprehensive records disposal schedule. Reports received to date indicate that field offices are now using the schedule to dispose of or to retire accumulations of records peculiar to the Service which have been held through the years for lack of disposal authority.

DESIGN AND CONSTRUCTION

The efforts of the Division of Design and Construction during the past year have been predominantly directed toward construction for improved public service facilities, concessions, and interpretive activities.

Buildings, Utilities, and Grounds

Service construction.—Construction activities have been concentrated on the installation of buildings and utilities, to alleviate the critical shortages of accommodations and interpretive facilities. The Service is engaged in the following construction projects and has funds with which to continue them:

At Mount Rushmore National Memorial—a concessioner's dormitory for 64 persons, a concessions building, and an amphitheater; at Grand Canyon—a public service building containing an information office, a collection-storage-work office, patio, museum, library, and restrooms, on the new south approach road; at Carlsbad Caverns—a public-use building and elevator lobby, museum, and naturalists' offices; at Isle Royale—multiple-unit overnight accommodations at Rock Harbor; at Grand Teton—campground developments at Colter Bay; at Yellowstone, campground developments at Canyon; at Colonial—public information centers at Yorktown and Jamestown; at Gillespie Gap on the Blue Ridge Parkway—the Museum of North

Carolina Minerals. These and other similar projects will cost about $5 million.

Concessioner construction.—The facilities listed above will be augmented by the following concessioners' development projects for new overnight accommodations which are completed or under way:

In Yosemite Valley—a registration office and new lodge containing a lobby and cafeteria; at Shenandoah—a registration office and lobby at Skyland; at Everglades—a day-use building with lobby and dining room, a boat servicing-and-rental building, and shelters at Flamingo; at Grand Teton—the newly completed Jackson Lake Lodge, which will accommodate 1,000 guests, and the proposed moderate-price accommodations at Colter Bay which will accommodate 600, with stores, shops, studio, dining room and cafeteria, fountain and snack bar for the cabin occupants and for the 1,200 persons who will occupy the Colter Bay campgrounds and trailer camp.

Other Service developments.—At Carlsbad Caverns National Park two new elevators have been completed and placed in service. There and at Mammoth Cave National Park and Oregon Caves National Monument, cave wiring has been modernized and improved.

New water and sewer systems, parking areas, roads, trails, and comfort stations to serve new or expanded campgrounds and picnic grounds have been completed in more than 25 areas. Successful negotiations and contracts for the introduction of commercial power or communications service or both have been concluded at 10 areas, to the definite benefit of the Service and the public. New or improved radio communication systems have been installed at 4 areas.

The construction of administrative, protective, and maintenance facilities and employee housing continues at much too slow a rate. To bring the public-use facilities up to reasonable requirements, at least $10 million will be needed for the next 10 years. However, Mission 66 when completed will give a more accurate figure.

Two studies.—Of notable interest and value has been the completion of two cooperative studies by the Public Health Service. The first and most far-reaching produced a detailed tabulation and report of "urgent," "necessary," and "desirable" sanitary engineering needs of the areas administered by the National Park Service. The second and equally valuable study is devoted to the problems of storage, collection, and disposal of garbage and trash. This involves a thorough analysis of current procedures in several of the major parks.

Park Roads, Trails, and Parkways

With respect to major roads construction, there has been notable progress toward completion of roads started many years ago, in consummating agreements of transfer affecting approach roads and other primary State routes, and in advancing construction on other roads. This has been made possible by contract authorization for 1955, 1956, and 1957 and by increased appropriations for 1955—$10,000,000 compared to $4,000,000 in 1954. The contract authorization for 1956 and 1957 is $12,500,000. These authorizations should be stepped up to $20,000,000 during the next 10 years to complete our program.

At Grand Canyon, the south approach and entrance road was completed; at Grand Teton, final paving has been completed on the 18.5 miles of road from Moran to the south entrance of Yellowstone; at Shenandoah, the paving of 48 miles of the Skyline Drive was begun, to complete the paving of the entire 105 miles, started several years ago. Construction of the 29-mile Zion-Bryce Canyon approach road has been completed and the road is to be transferred to the State of Utah for maintenance.

Work has been started on the 5 miles of the Shiloh-Corinth Road which lies in Mississippi. When completed this will be taken over by the State. Yellowstone Park route known as the Gallatin Road is being built in stages by the State of Montana, which will maintain it on a permit basis.

Good progress is being made on grading, tunnel excavating, and base surfacing on the 13-mile Heart o' the Hills Road in Olympic National Park. At Mount Rainer, there is similar progress to be reported on the 18-mile Stevens Canyon Road, so that completion may be expected with the work programed for 1956. At Kings Canyon, major structures and other work on 9 miles of the road from the end of State Route 180 at Deer Cove Creek to the terminal loop at Copper Creek will be completed in 1956 and 1957.

Parkway Construction

In the fiscal year 1955, the Service received $10 million in appropriations and contract authorization to continue construction on the several parkways. We have contractual authorization for 1956 and 1957 of $11 million per year. Like our road and trail item, this should also be increased. We hope that we can get this contract authorization increased to $17 million during the next 10 years.

Blue Ridge Parkway.—By the end of the year, work in progress on the Blue Ridge totaled $2,816,500 in major construction contracts. These included the grading and bridge structures to complete the 10-mile gap between the end of present construction south of U. S. 60 and the James River. The James River Bridge, to be programed in 1957, will close the only gap between Shenandoah National Park and U. S. 460 near Roanoke, Va., a distance of 108 miles. A 3-mile unit in North Carolina near Blowing Rock, started with funds appropriated previously, and including grading and a grade separation over U. S. 321, was completed. The grading and surface treatment of 11 miles between Wagon Road and Beech Gaps, west of Asheville, started before World War II, were also completed, as was the $90,500 grade separation over U. S. 58, at Tuggles Gap, in Virginia.

Colonial Parkway.—Construction under contracts totaling $2,129,420 was in progress by the end of the year, primarily on the 9-mile portion of the parkway between Williamsburg and Jamestown Island and at the parkway terminus at Yorktown. This work is on a tight construction schedule in order to complete the parkway in time for the 1957 celebration.

Natchez Trace Parkway.—On the Natchez Trace, $1,679,440 worth of major construction was under way by the end of the year. Contracts included the grading of 13 miles in the vicinity of Mathiston, Miss., to complete a continuous 102-mile parkway unit from Ridgeland, near Jackson, to U. S. 82, near Mathiston. Fifteen miles are being paved; when this is completed the southern 79 miles of the 102-mile unit will be continuous pavement. During the year, 34 miles of continuous paving were opened to use and an overpass over the Frisco Railroad near Tupelo, Miss., was completed. The cost of these two projects was $640,190.

Baltimore-Washington Parkway.—This parkway, of which 19 miles is Federal, and which connects with the District of Columbia street system, was officially opened to public use last October. The 1955 appropriation contained no funds for it, but contracts amounting to $1,930,240, for 9 miles of paving, guard rail, and traffic signs, were completed.

General.—About $900,000 worth of public service facilities of various kinds were under construction at the end of the year. Work was started on the stabilization of Mount Locust, near Natchez, one of the oldest structures in Mississippi which served as an overnight stand on the historic Natchez Trace.

The Mississippi River Parkway project.—This project is now in the planning stages in several of the 10 States involved. The National Park Service has participated with the Bureau of Public Roads in assisting the States of Illinois and Minnesota in planning the land acquisition and right-of-way development, including the determination of boundaries, in accordance with the terms of the 1954 Federal Aid Highway Act.

Plan Preparation

The preparation of plans has involved principally keeping pace with the construction programs of the Service and park concessioners. It is possible also to report progress on the preparation of first editions of master plans for new and prospective areas such as Coronado National Memorial, Harpers Ferry National Monument, Cumberland Gap National Historical Park, Cape Hatteras National Seashore, and Fort Caroline National Memorial, as well as for Fort Washington, a unit of the National Capital Parks.

Personnel

Student assistant training program.—The program for the systematic employment of promising students majoring in landscape architecture, architecture, and engineering during summer vacations after their sophomore and junior years has been continued; more than 80 will be employed by the Service this summer. Their duties are to assist in preparing master plans, conduct surveys, and make plans for construction projects.

Recruitment.—The eastern office of Design and Construction is at approximately 65 percent of ceiling strength; the western office at 70 percent. It has been difficult to obtain qualified professional personnel at present authorized salary rates.

COOPERATIVE ACTIVITIES

Changes in the National Park System

Proposed new areas.—No new areas were established or authorized during the year but progress was made on several proposals. Bills to authorize the establishment of a Virgin Islands National Park were introduced in Congress and hearings were held on them. Mr. Laurance Rockefeller has offered to acquire and donate to the Federal Government the necessary lands for this proposed park on the island of St. John. A bill was pending to authorize the City of Refuge National Historical Park in Hawaii. Cooperative agreements were under consideration whereby Chimney Rock in Nebraska and Promontory Summit in Utah might be designated National Historic Sites in non-Federal ownership. Sponsors made good progress toward provision of lands and road rights-of-way for the proposed Fort Union National Monument in New Mexico, which was authorized by Congress in 1954.

Area abolishments.—The Service has adopted a program to eliminate from the National Park System those few areas which are considered to be primarily of State or local significance. Bills were introduced in Congress to disestablish the following national monuments: Castle Pinckney in South Carolina, Fossil Cycad in South Dakota, Old Kasaan in Alaska, and Verendrye in North Dakota.

Boundary adjustments.—Without impairing monument values, 29,118 acres were excluded from Glacier Bay National Monument in Alaska by Presidential proclamation. Bills, favored by the Service, were introduced in Congress to revise the boundaries of Theodore Roosevelt National Memorial Park, and Devils Tower and Pipestone National Monuments. A bill to delete lands from the eastern side of Mount McKinley National Park, Alaska, was considered detrimental. The Service studied the following areas in order to determine better boundary lines: Carlsbad Caverns, Everglades, Grand Canyon, Kings Canyon, Lassen Volcanic, Mount McKinley, Sequoia, and Yosemite National Parks; Badlands, Fort Vancouver, Grand Canyon, Great Sand Dunes, Katmai, Oregon Caves, and Petrified Forest National Monuments; and Lake Mead National Recreation Area. In most cases boundary adjustments, involving both additions and deletions of lands, will require legislation.

Threats averted.—The Corps of Engineers concluded that protection against floods on the Snake River could be obtained without constructing levees within Grand Teton National Park; the Department of the Navy dropped its proposal to use a considerable portion of Death Valley National Monument as part of an aerial gunnery range; and a request to erect a television transmitter on the top of Scotts Bluff in Scotts Bluff National Monument was denied by the Director, whose action was later approved by the Department.

Special studies.—Cooperative scientific field studies in Katmai National Monument, Alaska, begun in 1953, were completed in 1954. Scientists from several Federal agencies and State universities participated in agricultural, archeological, biological, geographical and geological studies, and their reports are being prepared. Other special studies included: Agricultural and biological studies at Glacier Bay National Monument; geological, paleontological, wildlife, and grassland studies of Badlands National Monument; and a wildlife study of Mount McKinley National Park.

State Cooperation

Advisory service.—Advisory and consultative assistance on a wide variety of park and recreation problems was furnished to 47 of the States and Territories on 219 occasions. Among the more significant examples were, (1) participation in field studies and recommendations for a program of forest management in Itasca and St. Croix State Parks in Minnesota, (2) assistance to the State Historical Society of North Dakota in programing development of the International Peace Garden, (3) evaluation of the State park situation in Nevada to provide data for consideration by the legislature, which reactivated the

State park commission and appropriated funds for State park purposes, (4) assistance given to Alaska officials in preparing legislation designed to advance Territorial park and recreation programs, (5) technical advice to the Washington State Parks and Recreation Commission on restoration problems at Fort Simcoe State Park, (6) a field reconnaissance of a portion of the gulf coast and recommendations to the Texas State Parks Board on lands to be included in the proposed State Beach Park, and (7) advice to the Institute of Government, North Carolina, concerning organization for administration of historical properties.

Surplus property disposal.—Investigations were made of 11 surplus Federal properties totaling 733 acres requested by State and local agencies in 8 States and the Territory of Hawaii for park, recreation, and historic monument purposes, and recommendations were furnished to the General Services Administration and other disposal agencies.

The volume of work relating to determination and enforcement of compliance with the terms of the deeds of conveyance has increased appreciably. It will continue to do so, since this responsibility remains for a period of 20 years on each property or until the unamortized balance is paid. In addition to reviewing biennial reports submitted by the grantees and making occasional field inspections, the Service is called upon to grant changes in the conditions of the deeds, approve sale and exchange of lands, and accept payments of unamortized balances which free the grantees from use restrictions.

Following enactment of Public Law 387, approved June 4, 1954, amending the 1926 Recreation Act in several important respects, an arrangement was made with the Bureau of Land Management to handle, at the field level, all investigations and review of applications for public domain lands for park and recreation purposes. Reports on 10 such applications were made during the year.

Permission was granted to the Virginia Department of Conservation and Development to use approximately 100 acres of Pocahontas State Park (formerly Swift Creek Recreational Demonstration Area) for a prison labor camp to undertake conservation and highway projects.

Publications.—State Park Statistics—1954 shows a total of 1,968 State parks and related recreation areas containing more than 5 million acres; expenditures of $17,488,000 for capital improvements and $31,646,000 for operation and maintenance; attendance of more than 165,000,000; 5,096 year-round employees; and acquisition of 50 new areas and additions to 90 others, totaling more than 91,000 acres.

Other publications include State Park Fees and Charges, A Recreation Program for Alaska, and Recreation in Anchorage. The Digest of Laws Relating to State Parks, prepared by Flavel Shurtleff, counsel for the American Planning and Civic Association, under contract with the Service, was published by the National Conference on State Parks.

River basin and regional studies program.—In cooperation with State and local park agencies, the Service completed 20 recreation planning reports for Bureau of Reclamation reservoir projects and a complete recreation master plan for the Nimbus Reservoir in California. In addition, assistance was given to the Bureau in the negotiation of 10 reservoir management agreements with State and local agencies under which the State and local agencies will manage recreation areas of State and local importance. A report draft on the American River Basin, embracing 20 proposed reservoirs, 6 diversion pools, and several forebays was also completed.

Two studies and reports were made for the Corps of Engineers and 26 applications to the Federal Power Commission were reviewed in connection with the preparation of the Department's comments on them to the Commission. (The Federal Power Act requires the Commission to consider recreation among other beneficial uses when approving power projects.)

The end of the fiscal year saw completion of the Arkansas-White-Red River Basins and the New England-New York region recreation surveys. These 4-year projects were part of comprehensive resources studies conducted by Inter-Agency Committees established by the President. Several Federal agencies and each of the States concerned were represented on the Committees.

The AWR report recommends development of 39 day-use recreation areas on reservoir projects and of 29 areas primarily for weekend and vacation use. The report identifies 32 important historic sites and recommends their preservation in public ownership or by qualified quasi-public agencies. Four ecological areas with high scenic or scientific values are also identified in the report.

The New England-New York region report evaluates the recreation opportunities, or in some cases the damage that would result in existing recreation values, from construction of possible reservoirs inventoried by the Corps of Engineers. The report specifically urges that projects be not considered which would spoil the fine fishing, canoeing, and camping on the St. John and Allagash Rivers in Maine, which are widely known for their wilderness characteristics.

Satisfying progress was made on the Missouri River Basin Recreation Survey. Inventories of existing scenic, scientific, historic, and other recreational areas were completed. Publication of the full report is expected by January 1957. An archeological study and report on the basin was completed under a research contract with the University of Utah.

A survey of group camping needs in central Washington was completed by the School of Physical Education, Recreation, and Athletics of the State College of Washington, under contract with the Service. The survey was instituted as a pilot study to be used as a basis for further studies in the camping field.

Through the efforts of the Columbia Basin Commission, an advisory committee was appointed to represent the interests of the several communities around the Coulee Dam National Recreation Area. The committee will also advise the superintendent about priorities for the most desired and needed types of physical developments in the area.

INTEGRATED AUDITING

The internal audit program recommended by Administrative Assistant Secretary Beasley in April 1954 was placed in effect immediately, and audits were conducted throughout the 1955 fiscal year on this basis. The changed program provided for the integration of the auditing of businesses operating in the parks and auditing of the Service's own operations. The integrated program provided greater coverage of operations on an audit-cycle basis.

The change in the audit program and the fact that other Government agencies were offering positions one and two grades above that authorized for similar positions in the Service caused considerable turnover in the Service's audit staff. The difficulty of recruiting auditors at the grade levels authorized slowed the work; however, the cycle of audits scheduled is expected to be accomplished provided personnel turnover is at a minimum during the coming fiscal year.

The manuals used by this Service, covering both commercial auditing and governmental auditing were loaned to other bureaus and agencies at the suggestion of the accounting staff of the Office of the Administrative Assistant Secretary. It was believed these manuals would help these agencies in establishing audit programs similar to that in effect in this Service.

Difficulties in connection with the accounts and records of commercial operations in the park areas continue to be a problem. In two instances involving large claims, the auditors were forced, because of inadequate records, to spend considerably more than the estimated audit time in establishing inventory quantities, pricing inventories established, and determining ownership of assets, claims of creditors, and amounts of franchise fees due the Government.

Claims of the Government against two former concessioners resulting from prior audits which are still not settled by the Department of Justice amount to $54,765.71 and $25,074.15.

THE PARKS OF THE NATIONAL CAPITAL

The dedication of the United States Marine Corps War Memorial depicting the historic Mount Suribachi flag-raising scene on Iwo Jima and the opening of the 19-mile Federal portion of the Baltimore-Washington Parkway were significant events in the National Capital Park system during the 1955 fiscal year. By act of Congress, approved June 29, 1955, the name of the Lee Mansion National Memorial was changed to Custis-Lee Mansion and the area designated by law as a permanent memorial to Robert E. Lee.

The completion of the reconstruction of Beach Drive in Rock Creek Park north of Military Road and between Tilden Street and Blagden Avenue were notable improvements to this largest and most important unit of the parks in the Nation's Capital. Off-street parking along both reconstructed sections of the drive, a new public comfort station near Pierce Mill, substantial progress on a culvert for flood control at the Beach Drive-Military Road intersection, and the completion of a stable for mounted police were also important Rock Creek Park accomplishments during the 1955 fiscal year.

The installation of a new and improved two-way radio system for the United States Park Police makes possible, for the first time, communication with motorcycle mounted police as well as cruiser personnel.

The study to determine the most appropriate treatment for the preservation and interpretation of Ford's Theater, together with an estimate of the costs involved, was completed as required by Public Law 372. A prospectus for a Visitors Reception Center in the Nation's Capital was prepared; a preliminary study of new floodlighting for the Washington Monument was approved by the Fine Arts Commission; the pillow from the bed upon which Abraham Lincoln died and a George Washington Parke Custis bed were important acquisitions of original historic objects for the House Where Lincoln Died and the Custis-Lee Mansion.

A quarter of a million people saw the productions staged at Carter Barron Amphitheater during the 1954 summer season. The program featured light opera, the National Symphony Orchestra, ballet, a New York musical, and an ice show. The theater was operated without loss which gives some assurance of the long-term continuation of this popular cultural feature of the National Capital Parks outdoor recreation program.

The beautiful American elms which have been an important feature of the Washington parks for generations are now threatened by the elm scorch as well as the Dutch elm disease. Control of both diseases requires the removal and burning of the infected trees. More than 500 elms were victims of the two diseases during the year, including many towering specimens on the Ellipse and elsewhere in the central area of the Nation's Capital. Hurricane Hazel and the continued dry weather of the past 2 years have also taken a heavy toll of the trees in the park system. Both park improvements and regular maintenance have suffered from the necessity of applying more man-days for tree removal, pruning, feeding, and watering.

Mountain climbing.—Grand Teton, Mount McKinley, Mount Rainier, Olympic, Rocky Mountain, Glacier, Sequoia, Kings Canyon, Yosemite, and Zion National Parks and Devils Tower National Monument are the important mountain climbing areas of the System, offering serious rock work. Growing public consciousness of the need of safety precautions and safe practices is reflected in the general decline in mountain-climbing casualties.

Fred B. Ford, Jr., a guide with the Petzoldt-Exum Climbing Guide Service at Grand Teton, was killed in June in the course of a Grand Teton climb, first hit by a falling rock then, while waiting rescue, falling about 1,000 feet. The recovery of his body and the rescue of one of his charges in blizzard conditions on the upper slopes of the peak was one of the most dangerous and heroic in national park annals, participated in by both Service and other skilled mountaineers.

The Advisory Board.—Secretary McKay appointed Carl I. Wheat, distinguished attorney of San Francisco and Washington, D. C., and Dr. E. Raymond Hall, chairman of the University of Kansas Department of Zoology, to membership on the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments. They succeeded Dr. Harold E. Anthony, dean of the American Museum of Natural History scientific staff, and Dr. Theodore C. Blegen, dean of the University of Minnesota Graduate School, both of whom had given exceptional service to the board.

Boy Scout award winners visit two parks.—Twelve Explorer Scouts, regional winners of Boy Scout Conservation Good Turn Awards, in the course of a western trip in June and early July to see "conservation in action," visited Grand Teton and Yellowstone National Parks. Two days of their stay in Yellowstone was spent on a "campout" on Peale Island, in Yellowstone Lake.

OFFICE OF TERRITORIES

Anthony T. Lausi, *Director*

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THE Office of Territories, with one of the smallest headquarters staffs among Federal agencies in Washington, watches over an astonishing variety of activities, in Territorial areas spread over two great oceans. These activities vary in each Territory. Altogether they include political administration, economic development directly and through aid to private enterprise, large health and education programs, and aid in securing Federal legislation beneficial to the Territories.

In the field of government the Office supervises political activities in some island areas new to the customs and practices of democratic institutions. In others, where there has been long experience with these institutions the Office has no direct political functions but aids Territorial governors and their staffs in maintaining their relationships with the Federal Government.

In the economic field the Office operates a hundred-million-dollar railroad in Alaska, builds and maintains a huge network of roads in that Territory and administers an Alaska public works program.

In the Pacific the Office promotes sea and air transportation and in many ways aids and encourages agricultural, industrial and business development. In the Caribbean it has administered economic aid programs which have been liquidated as fast as private enterprise and Territorial local government units have been in a position to assume their proper responsibilities.

In the field of public health and education, the Office either builds and maintains needed facilities or promotes their development by Territorial governments.

The fiscal year, ended June 30, 1955, has seen marked improvement in the businesslike administration of these Federal functions in the Territories for which the Office of Territories is responsible. The Alaska Railroad has closed the year with a $2,600,000 surplus over expenses of operation, and has improved the transportation services provided shippers at the same time that expenses have been decreased. While the operation of a military pipeline from Haines to Fairbanks will cause an important reduction in revenues, every effort is being made to meet the financial problems which this loss in revenue will entail. Plans were far advanced for a seatrain service to Alaska to be operated by a large ocean carrier.

The Alaska Road Commission completed in 1955 its fiftieth year of service to the Territories in building and maintaining Alaska's road system. The paving program, which has already black topped hundreds of miles of through highways, was greatly advanced and winter maintenance activities expanded.

The Alaska and Virgin Islands public works programs have continued to supply much needed schools, utilities and other public improvements. The Virgin Islands program, however, under the Revised Organic Act, will be turned over to a reorganized Territorial government.

Plans were far advanced, through drafts of proposed Federal legislation, to transfer to the Territory of Alaska the care of Alaska mental patients, which, for many years, has been an Office of Territories function.

In the Pacific Islands the fiscal year has brought improved administration of government affairs, and economic development where such development has been sorely needed. In American Samoa, a draft constitution has been partially completed. Samoan annual exports were doubled through the operation of a government fish cannery leased to private interests. In Guam tax collections have been very greatly increased and important gains made in a program of public improvements.

In the Trust Territory of the Pacific Islands the centralization of headquarters supervision in Guam rather than Honolulu has brought marked improvement in administrative efficiency. The granting of a charter to the Palau Congress and the selection of a Micronesian to fill the post of District Education Administrator have been milestones in the evolution of island self-government. This is the first time in the history of American administration of the Trust Territory that a Micronesian has occupied a district official post.

The fiscal year saw another setback in the long-continued fight for statehood for Hawaii. Legislation providing statehood for both the Territories of Alaska and Hawaii was introduced into the House and Senate and both the Senate and House Committees on Interior and Insular Affairs held statehood hearings. The House committee reported out H. R. 2535 which would have granted statehood to Alaska as well as Hawaii. The House of Representatives voted to recommit the bill and no further action was taken by the Congress before the close of the legislative session.

In the pages that follow there is presented a more detailed picture of the many-sided activities of the Office of Territories.

ALASKA

Cooperation in Resource Development

Alaska's greatest need, now as in the past, is economic development based on the enterprise of her citizens. Because of huge Federal land holdings in the Territory there is no area of the United States in which there is more opportunity for wise Federal cooperation in meeting this need.

The first year of operation of the new pulp mill at Ketchikan provided additional year-round employment in southeastern Alaska and greatly increased the output of timber products from the Tongass National Forest. Additional large pulp mills and sawmills for the utilization of Alaska's vast timber resources are being planned at Wrangell, Sitka, and Juneau.

In addition to the loggers employed by the Ketchikan pulp mill the company is purchasing logs from around 50 independent loggers whose operations are conducted in almost every area of southeastern Alaska. This means that Ketchikan Pulp Co. paychecks are going into the smaller communities of Alaska and are having a stabilizing effect on the economy of these communities.

The fiscal year saw an amazing growth of interest in the possibility of oil production in Alaska. The Bureau of Land Management issued oil exploration leases covering more than half a million acres, and drilling was actively underway in areas around Cook Inlet and in the coast area east of Cordova.

The Department in the latter part of the fiscal year requested the views of the Senate and House Committees on Interior and Insular Affairs and the House and Senate Armed Forces Committees on the possible revocation of those portions of Public Land Order 82 applying to 25 million acres of land outside of Naval Petroleum Reserve No. 4 in northern Alaska. The Department of the Navy has advised that it has no objection to revoking Public Land Order 82 provided that the proposed revocation does not affect the present status of the lands in the Naval Reserve.

In order to promote the basic economic development of Alaska a resource development board was created by the Territorial Legislature. This board will foster and coordinate programs, for the use and management of Alaska's natural and other resources, for the promotion of general economic development, and for the provision of transportation facilities and other public works and facilities essential to such development.

Alaska Railroad Forges Ahead

The Alaska Railroad closed its books for the fiscal year 1955 with one of the brightest financial reports in its history. Net income amounted to $2,617,278.72 as compared with $719,524.65 in the previous fiscal year. It is highly significant that this record was achieved through economies that were accompanied by a noteworthy improvement in the services rendered to shippers.

On the unfavorable side is the fact that the military pipeline from Haines to Fairbanks is scheduled to begin operation shortly after the beginning of the next fiscal year. This will reduce by 80 percent railroad revenues presently derived from the movement of bulk petroleum products north of the Alaska Range. The railroad is attempting, in discussions with military authorities, to regain some of the threatened loss of tonnage in order to maintain the potential ability of the railroad to move large volumes of petroleum products in time of emergency. Other efforts will be made to achieve further economies and to attract additional commercial shipping to the Railroad. However, in the absence of counteracting factors which cannot be foreseen at present, the Railroad must face the inevitability of a decline in net revenue during the next fiscal year.

Though substantial sums have been appropriated by Congress for the rehabilitation of the Railroad in previous fiscal years much remains to be done in the way of ballasting, replacing untreated ties with treated ties, and grading of roadbed. The rehabilitation program will be continued but costs in connection therewith will be met from earnings. Crushed ballast will be utilized in lieu of pit run material to provide better drainage and smoother riding track. Field forces will be mechanized further in line with latest railroad practices, to increase production during the limited working season and to improve the quality of the work.

The rehabilitation of the roadway between Seward and Portage, being performed under contract, was 37 percent complete at the close of the fiscal year, with final completion scheduled for the second quarter of fiscal year 1956. At the close of the year plans were completed for awarding a contract for the construction of a new ocean dock at Seward.

As part of a major program for the retirement and replacement of obsolete and outmoded equipment, an order was placed for 100 multiservice ballast cars, 54 of which have been delivered, and specifications have been prepared for the acquisition of 50 flat cars equipped for handling large cargo vans. This latter feature should prove mutually advantageous to both the Railroad and motor carriers.

Negotiations are under way for the acquisition of nine lift vans for transportation of cold storage items under controlled temperatures.

Plans are being developed also for the procurement of two Pullman cars upon receipt of which overnight sleeper service between Anchorage and Fairbanks will be provided.

Turn-around freight service between Anchorage and Seward has been inaugurated. This permits centralization of maintenance in Anchorage while the running time of freight trains between Anchorage and Fairbanks has been reduced to 22 hours. Further reduction to a 20-hour schedule will be made within a short time.

River boat operations by the Railroad were discontinued on March 1, 1955, when a 20-year contract was negotiated with the B. & R. Tug and Barge Co. of Kotzebue, Alaska, doing business as the Yutana Barge Line. This permitted the Railroad to meet an administration objective to retire from an unnecessary Federal operation when a contract carrier can be found to perform the service at a reasonable price.

As part of a major program to reduce railroad inventories, the General Services Administration assumed direction of a project to dispose of war surplus materials having an estimated acquisition value of $3,900,000. Realization from sales amounted to about $500,000 with costs incident to the program amounting to approximately $80,000.

At the close of the fiscal year the railroad signed an agreement with the Alaska Steamship Co. which looks to the inauguration of seatrain service to Alaska. Specially designed car ferries will be built for this service, which it is proposed to begin within 2 years. Such an operation will mark a revolutionary change in freight transportation to and from Alaska.

Alaska Road Commission Completes Fiftieth Year

During the fiscal year the Alaska Road Commission completed half a century of service to Alaska, an occasion marked by appropriate ceremonies at Juneau. Created by act of Congress as an agency of the War Department in 1905, and transferred to the Department of the Interior in 1932, the Commission has administered the major portion of the Territory's highway development program from its inception.

As of June 30, 1955, the highway system of Alaska totaled 3,543.5 miles, of which 2,174 miles were maintained open the year-round, plus 248 miles of trails. The primary or through system, consisting of the Richardson, Alaska, Glenn, Seward-Anchorage, and Haines Highways, is approximately 80 percent paved. The balance is scheduled for paving in the immediate future. This system connects Alaska's principal cities, seaports and military installations with one another and with the continental United States via the Alaska Highway through Canada.

Principal projects active during the year include:

Glenn Highway.—The 189-mile portion of this route from Anchorage to Glennallen Junction is paved. Of the 125-mile Tok Cutoff portion from Gulkana Junction to Tok all but 35 miles are paved. At the close of the year contracts for paving this final section, and for construction of five bridges on this route, were active.

Alaska Highway.—Late in the year a contract was awarded for reconstruction of the final 44 mile section of this 207-mile route. This section, and an additional 30-mile section, are scheduled for early paving. The remaining 133 miles are paved. In addition six bridges were under contract construction at the close of the year.

Richardson Highway.—Paving of 221 of this route's 365 miles is complete. Two contracts, for paving a total of an additional 104 miles, are active. A contract for paving the final 40-mile section is scheduled for award in the near future.

Copper River Highway.—A contract to advance the roadway being constructed on the abandoned Copper River and Northwestern Railroad grade to mile 39 was awarded during the year. This route will open up considerable potentially productive mineral land for exploration and development, and will connect another all-weather, ice-free port, Cordova, to the highway network.

Denali Highway.—Construction of this 162.9-mile route to connect Mount McKinley National Park—the Nation's second largest—to the highway network, was begun in 1951. The project has been prosecuted from both the McKinley Park and Richardson Highway (at Paxson) termini simultaneously, and is passable from Paxson 42 miles west to the MacLaren River, and from the park 82 miles eastward to the Susitna River.

Taylor Highway.—Construction of this 161-mile route was initiated in 1947 by Government forces. It connects Eagle, Alaska and Dawson, Yukon Territory, with the highway network, and, with Canadian roads, provides a 381-mile military bypass of the Alaska Highway. The project is approximately 95 percent complete, and is passable over its entire length.

Maintenance.—Transition of the Territory's economy from a seasonal to a year-round basis has necessitated a greatly enlarged program of winter maintenance. Since the road system traverses an area of continental size, where climate ranges from the comparatively moderate temperatures and heavy snowfall of the south coastal areas to temperatures of 70° below zero with light snowfall in interior Alaska, special maintenance methods and equipment are required. In keeping open the entire 1,200-mile primary system and approximately 1,000 miles of connected feeder and local systems, every type of modern snow-fighting equipment, supplemented by specially designed rotary plows believed to be the world's largest, is utilized. The Thompson and Isabel Pass areas are now maintained open the year-round, in spite of 80-foot annual snowfalls and 100-mile-per-hour gales.

Access roads.—Of great importance to the public at large is the construction of access roads and highways into areas opened up for homesteads, homesites and recreational areas. The Alaska Road Commission works very closely with the Bureau of Land Management in this respect, referring all petitions for new roads to that agency and continually requesting advance information as to new areas to be opened.

The Governor of Alaska in his message to the 22d Territorial Legislature meeting in January 1955, urged greatly needed increases in motor fuel taxes. As a result a new tax of 5 cents a gallon was levied on all motor fuel sold and delivered and a tax of 3 cents a gallon was levied on aviation fuel. This will permit an increase in Territorial funds which can be made available for highway construction.

Recognizing the problems that increased highway use has brought to the communities of Alaska, the Department recommended enactment of legislation to authorize the Alaska Road Commission to construct and maintain roads within towns of Alaska. Under the basic act establishing the Commission in 1905, construction was only authorized to and between towns. The Department recommended legislation authorizing the construction and maintenance of roads within unincorporated towns and settlements, and the construction of through roads only, without maintenance, in incorporated towns. The necessary legislation was passed by Congress shortly after the close of the fiscal year and was approved by the President on July 14.

Alaska Public Works Program

A $70,000,000 program of public works in Alaska was authorized by the Congress in 1949 by Public Law 264, 81st Congress. As amended, this act provides for continuance of the program through June 30, 1959.

The express purpose of the act is to foster the settlement and increase the permanent residents of Alaska, to stimulate trade and industry, encourage internal commerce and provide investment, develop Alaska resources, and provide facilities for community life.

In the fiscal years 1950 through 1955 inclusive there has been appropriated by the Congress for this program $50,708,200. This has been sufficient to finance 113 projects. The projects are constructed by the Federal Government under contracts after competitive bidding. Upon completion they are sold to the applicant, municipalities or other public bodies. The projects must be sold to applicants at prices calculated to insure that the whole program shall return to the Federal Treasury not less than 50 percent of the total cost of the program.

These projects include schools, hospitals and other health facilities, sewer and water systems, libraries and other community buildings, and other useful types of community projects.

Of these 113 projects, a total of 35, costing $8,524,844.64, have been completed and sold to applicants; a total of 26, costing $9,332,178.44, have been completed and are in the process of being transferred to the applicants; 37 projects, estimated to cost $25,592,200, are presently under construction and will be completed and transferred with all due dispatch; and the remaining 15 projects, estimated to cost $7,112,600, will be started later in this building season or not later than the start of the building season which opens in May of 1956.

Proposed Transfer to Alaska of Mental Health Program

A vigorous attempt is being made to secure legislation to modernize commitment procedures and to transfer responsibility for and operation of the mental health program to the Territorial government. To assist Alaska in assuming this new financial burden, the legislation recommended by the Department provided grants amounting to a total of $6 million over a 10-year period. Other features of the bill were an additional grant of $6,500,000 to construct facilities for the treatment of the mentally ill in the Territory and a grant of public lands to assist in meeting the cost of the program.

Responsibility for the care of the mentally ill was initially assumed by the Federal Government because of the Territory's special circumstances at the turn of the century. It has continued as a Federal responsibility largely because of Alaska's limited financial resources. The Department and this administration have been vitally concerned with the shortcomings of the program, particularly with regard to the archaic commitment procedures established in 1905 and not since modified. The House Committee on Interior and Insular Affairs held a series of hearings in Washington and Portland, Oreg., on this subject, and favorably reported the Alaska mental health bill in July 1955.

At the close of fiscal year 1955 there were 359 patients under care at Morningside Hospital, Portland, Oreg., the institution under contract with the Department of the Interior for the care and treatment of Alaska's mentally ill.

HAWAII

The Department's continued interest in securing passage of Hawaii statehood legislation was again evidenced this year with the appearance of Secretary McKay before the House Committee on Interior and Insular Affairs in support of H. R. 2535, the Hawaii enabling legislation. Although the bill was reported favorably by the Committee, the measure failed of passage when a motion to recommit was adopted on the floor of the House.

The rising unemployment trend which last year was of considerable concern in Hawaii was reversed through a record tourist trade and increased Federal expenditures in the Territory. During the year workmen's compensation and unemployment insurance benefits were increased and the territorial minimum wage was raised.

Contracts totaling $6,667,343.94 for public works projects were let. Of this amount highways accounted for $3,625,893.14, or more than one-half of the total amount.

In the public health field, emphasis was given to the operation and support of programs for the prevention of disease, early diagnosis, prompt treatment, and effective rehabilitation. A highlight in the educational program has been a joint teacher, parent community instructional policy evaluation program involving 4,000 participants in 140 committees.

TRUST TERRITORY OF THE PACIFIC ISLANDS

The fourth year of civilian administration in the Trust Territory of the Pacific Islands was noteworthy because of steady progress in all aspects of administration, especially in the districts which were strengthened by a restaffing of personnel. Health and education facilities were expanded, the land claims and agricultural programs were strengthened, and there was an increase in goods exported. The year also saw the discontinuance of phosphate mining on Angaur in the Palau District and the close of the Island Trading Co., with the assumption of many of its functions by Micronesian trading companies.

The headquarters offices in Honolulu and in Guam have been consolidated on Guam. This move has greatly aided the rapport which exists among the Federal agencies and private concerns serving the Micronesians.

By Executive Order No. 51 of March 10, 1955, the island of Rota became a district. This action permits Rota to be administered as a district rather than as a special project of the headquarters operation.

In the education department a Micronesian replaced an American as a District Education Administrator. This is the first instance of a Micronesian assuming full charge of a district department. Another significant achievement was the establishment of five additional annual scholarships for Micronesians to go outside the Trust Territory for higher education. There are ten annual scholarships now available to Micronesians.

Progress in Public Health

The Public Health Department postgraduate education has been increased to include grants to four medical practitioners and four nurses. This is an increase of two men and two women over the previous year. For the men, this postgraduate training includes all phases of medical care and is accomplished at Hilo Memorial Hospital, Hilo, Hawaii. Training for nurses covers all phases of nursing care and is conducted at the Leahi Hospital, Honolulu, Hawaii.

At the end of the calendar year 1954, 22 students returned from the Central Medical School, Suva, Fiji, and were employed by the health department in their respective fields of medicine, dentistry, pharmacy, and laboratory work. Sixteen Micronesians received intensive training at a special school for sanitarians. Upon graduation they were given field assignments and initiated an expanded program especially in the outer islands.

A significant change will occur when island lepers and mental patients are transferred from Tinian and Saipan to their home districts. This move will reduce the daily care costs to one-third the cost of maintaining them at Tinian and Saipan. The patients will be under the constant care of Trust Territory physicians and all treatment will be in accordance with approved and up-to-date therapy.

Economic Development

Commercial ships started calling at Majuro in the Marshall Islands during the fiscal year. This change permits direct contact with the outside world and provides lower port costs. Interisland shipping has been strengthened in order to permit the districts to complete more field trips each year. These extra field trips have encouraged the Micronesians to process more copra for export. The copra is purchased from Micronesian trading companies by a United States commercial firm and sold in world markets.

Air transportation was speeded up by the acquisition of three SA–16 Grumman Albatross planes which are faster and carry more passengers than the retired PBY's.

The agricultural program has been strengthened and new stock and crops have been introduced. Major emphasis has been on subsistence crops and on coconuts and trochus for export.

All claims of the inhabitants for yen sequesterd by military authorities in the war were settled during the year.

An appropriation of $700,000 for new construction was granted for fiscal year 1955. Work on several much-needed projects was begun. New power plants at Koror and Ponape, leprosaria at Yap and Ponape, new housing and a new office building in Guam have been completed and are now in use. Among the projects under way are two hospitals, a nurses' training school, six warehouses and major repairs to piers and wharves adjacent thereto. In addition to the $700,000 appropriated, an additional $281,500 was made available from savings in operations and local revenues, thus permitting a total of $981,500 to be allocated for projects now in progress or to be started in the very near future.

During the year considerable progress was made in defining and delineating land and claims problems so important to the Micronesians. A survey team spent several weeks in Rota and was able to distinguish most of the public lands from private lands.

The Ponape District has homesteaded in excess of 1,500 acres of public domain to eligible islanders and is continuing this program. In the Palaus, over 400 acres of public land were made available to Micronesians for agricultural purposes.

Palau Congress Granted Charter

The granting of a charter to the Palau Congress marked the integration of newly acquired democratic concepts with traditional Palauan institutions. This is a step in the direction of self-government toward which the Palauan people and their Congress have been working for many years.

The Congress, like its predecessor, serves as an adviser to the District Administrator and is empowered to acquire and administer real property, levy taxes, disburse funds, and pass laws for the district. The elected leaders in "the deciding body for the people" are for the first time permitted to draw up their own budget based upon income derived from districtwide taxation and to formulate laws which will be submitted to the High Commissioner for approval.

The High Court opened its first criminal session since 1953 in Palau. A first sitting of the trial division was held at Namorik in the Ralik Chain of the Marshall Islands.

A detailed report of the administration of the Trust Territory was given to the Trusteeship Council in June 1955. One Micronesian adviser assisted the United States delegate.

GUAM

One of the most significant developments during the fiscal year was the increased revenue from taxation realized as a result of an accelerated tax collection program instituted in the Office of the Commissioner of Revenue and Taxation. Guam's estimated income from all sources for the fiscal year was $7,975,000. Actual income was $10,-

189,000, leaving a surplus of approximately $2,314,000 which the Legislature appropriated to school construction, public utilities and capital improvements.

Public utilities expansion, with the full cooperation of Navy authorities on the island, has made good progress. A new government telephone exchange opened, serving, in addition to the government lines, approximately 100 telephones formerly maintained by the military services. Power rates set by the Navy for power generated in its plant have been readjusted favorably after a sudden increase instituted last November, and obsolete, deteriorating water mains are rapidly being replaced.

Specific capital improvements projects completed during the year were the tuberculosis wing of the new Guam Memorial Hospital dedicated on June 4; the new 12-room grade school in Umatac village; and a new bridge over the Talofofo River, replacing the bridge washed away during a 1953 typhoon.

Construction of the round-the-island highway continued, but completion of the final connecting link was delayed with advent of the rainy season. The Department of Public Works project for gradual paving of village roads and streets was given additional impetus, with paving completed in two villages and commenced in several others.

Preparation of the Health and Sanitation Code, the Insurance Code, and the Agricultural Code was completed and referred to the Legislature for enactment into law.

Perhaps the most important single problem now facing the Government of Guam is the lack of an adequate physical plant to care for the continually increasing number of school-age children. The problem is aggravated by the enlargement of the Air Force complement on Guam with a consequent increase in resident dependents. The Guam Legislature, recognizing the importance of an early solution, appropriated $700,000 for a coordinated plan of school construction drawn by a select committee and submitted to the Interior Department. New Federal school construction legislation is pending in the Congress. The Office of Territories has been instrumental in persuading the House and Senate committees considering the measures to include Guam in their coverage. There is good reason to be optimistic about the enactment of such legislation in the second session of the 84th Congress. Existing Federal school construction aid statutes do not cover Guam.

AMERICAN SAMOA

The fiscal year has been marked by important steps toward a greater degree of self-government for American Samoa. A constitutional committee has partially completed a draft constitution tailored to fit the needs of the Territory and based on the principles of American democracy. Increasing authority has been delegated to district governors and other local government officials.

Increased effort has been devoted to medical services and public health. Measures to carry public health consciousness into outlying villages have been intensified. Practically all typhoid fever cases had been eliminated by the end of the fiscal year. Emphasis on malnutrition detection at early stages has resulted in a low incidence of this preventable condition. Higher standards of sanitation and hygiene have been set.

In an endeavor to assist the people to help themselves in the field of education, village leaders have been encouraged to improve, and in some instances to construct new schools. This cooperative effort and the feeling of local responsibility which it emphasizes are essential ingredients of the policy of this Administration.

The strengthened economy throughout American Samoa is reflected in the annual report of the Bank of American Samoa. Total assets increased over $165,000. The bank has had numerous requests for loans for the establishment of new business enterprises and for the development of existing plantations in Manu'a since construction of the dock and roads began in these outlying islands. General improvement in the economy is largely due to confidence among the people in the stability and the economic development program of the Government.

In accordance with the Government policy of providing incentive to industry the Van Camp Sea Food Co. has been able to bring its cannery into full production during the year and currently employs over 300 local people.

The lack of direct air transportation between Honolulu and American Samoa is one of the greatest deterrents to economic development. An important part of the current economic program is the development of Tafuna Airport for the accommodation of Pan American Stratocruisers on their South Pacific route. The PAA application to substitute American Samoa for its stop at Canton Island has been approved by the President of the United States. Nonscheduled flights from Honolulu to American Samoa have been approved by the Civil Aeronautics Board.

The agricultural extension program has been expanded to assist in developing agriculture on the village level, and to encourage each village to apportion its lands to crops that will be of maximum benefit. By means of pilot projects at the Experimental Farm and Dairy the Samoans are being encouraged to improve their poultry and livestock. Two thousand acres of cocoa, a cash crop, are now under cultivation as a result of an intensive cocoa planting program.

The total cost of operations during the fiscal year 1955 was $1,565,101 as compared to $1,575,723 in the fiscal year 1954, a drop of over $10,000. Accrued revenues total $591,317 in 1955 as compared to $524,970 in 1954. Export values in 1955 jumped to $1,270,548.10 from $546,237.67 in 1954, largely due to the export of canned tuna.

THE VIRGIN ISLANDS

The reorganization of the Government of the Virgin Islands required by the Revised Organic Act signed by the President on July 22, 1954, took effect during the fiscal year. The Legislature established under the Revised Act, a unicameral body composed of 11 senators, met in its first regular session on January 10, 1955. At the same time the Executive Branch of the Government was reconstructed into nine major departments.

A Government Comptroller was appointed by the Secretary of the Interior on October 26, 1954. A Commission on the Application of Federal Laws to the Virgin Islands was appointed by the President on December 15, 1954, and it is expected that the Commission's recommendation will be submitted to the Congress on or about July 22, 1955. A contract for the preparation of a Virgin Islands Code was executed in the Interior Department, and an advisory committee was appointed by the Secretary of the Interior to assist in the codification of the laws.

A new system of accounting has been installed. Tax administration activities have been centralized in one office. A single treasury has been created to replace two separate treasuries of the former municipality of St. Thomas and St. John and the municipality of St. Croix.

The general health of the Virgin Islanders has been good despite the primitive sewage-disposal methods for large parts of the communities. The occurrence of two cases of typhoid fever points up the need for increased emphasis on sanitation.

Notable improvements have been made in the telephone systems throughout the Islands. During the coming year, the organization and accounting procedures will be improved to accomplish maximum control. Every effort will be made to develop an adequate potable water supply system. The sewage system will be extended. The pumping system for salt water fire protection and flushing will be improved and extended. As funds become available, it is anticipated that approximately $3 million in special public projects will be started.

During the fiscal year the total insular revenues collected amounted to $2,916,094 as compared to $2,408,866 for the previous year, an increase of $570,228. In accordance with the Revised Organic Act, there was transferred to the Government of the Virgin Islands by the Federal Government, matching funds in the amount of $2,026,207 and essential public projects funds in the amount of $1,872,992.

THE VIRGIN ISLANDS CORPORATION

The Virgin Islands Corporation continues to be the backbone of the economy of the Island of St. Croix, where the growing and processing of sugarcane provides employment to the majority of the population. The 1955 sugarcane crop was slightly larger than the previous year, and operations in general were more successful than in prior years. In spite of low sugar prices, losses were reduced and a higher efficiency obtained.

The power plants on the two main Virgin Islands, St. Thomas and St. Croix, maintained steady growth in respect to generation, distribution, and consumption, and their operations continued to show a profit. During the year power was extended to several of the smaller islands and arrangements were made to extend power from St. Thomas to St. John, an important step in the development of the latter island.

The Corporation took over the operation of the former Air Facility and Submarine Base, St. Thomas, on July 1, 1954. Considerable progress was made in restoration of the properties and in developing them for the benefit of the people of the Virgin Islands.

CONSTRUCTION OF PUBLIC WORKS

In 1944 the Congress authorized a public works program to assist in the internal development of the Virgin Islands, and a total of $11,303,592 has since been appropriated. No additional appropriations for this program will be made as Public Law 517, 83d Congress, known as the Revised Organic Act of the Virgin Islands, has provided for the Virgin Islands Government to construct its own public works.

A large quantity of specialized movable equipment, including X-ray machines, furnished and installed during the fiscal year 1955 in four hospitals earlier completed under the program, has provided unexcelled facilities for the development of extensive surgical and medical services, previously not available in the Islands.

During the fiscal year 1955 there were completed four schools on St. Thomas, including a high school in Charlotte Amalie and three rural schools, providing classrooms for 1,374 pupils; together with two schools on St. Croix, including a consolidated high and elementary school in Christiansted, and a rural school at LaVallee, providing classrooms for 1,235 pupils. An auditorium has been provided in each of the high schools for use in the school programs and community assemblies.

Construction of four schools on St. John, including a consolidated elementary school in Cruz Bay and three rural schools, providing classrooms for 245 pupils, which will be completed in time for the school term beginning in the fall of 1955, will adequately supply all the necessary school plant facilities for the Island.

A secondary road being constructed between Cruz Bay on the west coast of St. John with Coral Harbor on the east coast will provide a long needed overland transportation route across the Island and will prove a valuable contribution to the economic development of the area. A new intercepting sewer on St. Thomas will be constructed during 1955 to supplement existing facilities.

Final projects planned for this program, for which plans and specifications have been completed and made available to the Virgin Islands Government for construction under the program authorized by the Revised Organic Act, include three schools in Charlotte Amalie providing classrooms for 1,950 pupils, and two schools on St. Croix providing classrooms for 810 pupils. These projects also include a road or parkway upon land lying behind the previously completed seawall on St. Thomas. The construction of these schools by the Virgin Islands Government will complete the projected school plant facilities for the Islands, and the construction of the road or parkway will provide an essential transportation route from Bourne Field Airport in the western section to the new housing development in the eastern part of St. Thomas, thus relieving the congestion on the one existing narrow thoroughfare, and contributing to the recreational development of the 30 acres of land reclaimed by the seawall.

LIQUIDATION OF PUERTO RICO RECONSTRUCTION ADMINISTRATION

The successful liquidation of the Puerto Rico Reconstruction Administration, pursuant to Public Law 276 of the 83d Congress, was accomplished during the year and the agency was closed on February 15, 1955.

The PRRA was conceived in 1955 as a relief organization to offset the ravages of nature and the economic depression which gripped the world in that period. The programs of the agency provided Puerto Rico with many needed benefits and improvements in a wide variety of sociological and industrial fields. By 1947, however, PRRA's basic mission had been accomplished, and the first liquidation efforts began. These culminated in the adoption of Public Law 276 referred to above.

In the 18-month period established by the law for the liquidation of PRRA, almost 10,000 mortgages and pieces of real property located in both urban and rural areas of Puerto Rico were disposed of by discount incentives. Notes of sugar cooperatives were settled by negotiation on the basis of the difference between the Government interest rate and that of private banking institutions.

The liquidation preserved $2,619,786 in the PRRA revolving fund and realized $5,379,685 through the sale of assets and settlement of mortgages. These amounts, together with additional assets of $445,966 which accrued to the Federal Government, permitted the salvaging of a total of $8,445,437, while eliminating a wholly outmoded and currently unnecessary activity of the Federal Government.

PUERTO RICO TRAINING PROGRAM FOR TECHNICAL ASSISTANCE

The Department of the Interior continues to serve as the Washington office of the technical assistance program for the Government of the Commonwealth of Puerto Rico, under a special agreement between the Secretary of the Interior and the Governor of Puerto Rico. During the fiscal year 1955, a total of 891 foreign nationals (including trainees, visitors and observers), representing every country of the world except the Soviet Union and its allies, visited Puerto Rico. The area from which these foreign nationals came and their sponsorship is shown below:

Sponsor	Latin America	Near East, Africa, and South Asia	Far East	China and Indo-china	Europe	Total
Foreign Operations Administration	313	45	110	17	2	487
FOA-Caribbean DOTS	99					99
United Nations and specialized agencies	81	19			2	102
Organization of American States	14					14
Other foreign trainees, visitors and observers (nongrant)	[1] 160	13	6	2	8	189
Total	667	77	116	19	12	891

[1] Includes 10 grants made by Puerto Rico under the Commonwealth exchange program.

NOTE.—United States visitors concerned with technical assistance (not in total), 58.

Office of the Administrative Assistant Secretary

D. Otis Beasley, *Administrative Assistant Secretary*

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THE Administrative Assistant Secretary discharges the duties of the Secretary with respect to administrative management. He determines the basic policies and procedures governing the activities under his supervision and coordinates by direction the conduct of these activities. The Administrative Assistant Secretary serves as the Department's representative on these matters before congressional, interdepartmental, and public groups.

During the year he has acted as the Secretary's representative in formulating the Department's position on individual recommendations contained in the reports submitted to the Department by the Commission on Organization of the Executive Branch of the Government.

The Office of the Administrative Assistant Secretary directed the Department's emergency relocation planning, providing guidance for successful participation in "Operation Alert" May 1 to June 15, 1955.

A report for each of the divisions under his supervision follows:

Division of Administrative Services

Floyd E. Dotson, *Director*

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THE Division of Administrative Services received additional work loads as a result of internal reorganizations within the Department, particularly with respect to the Office of the Solicitor and Office of Mineral Mobilization. It was able to maintain its full program for development and direction of administrative services throughout the Department in addition to the housekeeping and internal operating services provided for the Office of the Secretary. The Division also provided other departmental units with centralized library, museum, employee health, space, telephone, photographic, warehousing and shipping, duplicating, and printing and binding services.

Branch of Library Services.—Use of the library continued at about the same rate as in 1954. Statistics for 1955 indicate: 32,713 reading room patrons, 17,900 telephone calls, 88,967 items circulated, 8,191 interlibrary loans, 17,075 research queries, 12,663 books and 65,537 periodicals received. Total library holdings rose to 434,601 volumes.

Fiscal Section.—Budgeting and accounting services were provided for the Office of the Secretary and other departmental units not attached to the bureaus. Expenditures were approximately $6 million and working capital fund operations were over $1,200,000. The Section also handled the approximately $4 million transferred from other agencies for use by various bureaus in the Department.

Records Management.—A simplified filing system was installed in the Division of Security. Over 1,800 cubic feet of obsolete records were destroyed, 1,232 cubic feet of semiactive records were transferred from office space to storage areas, and 65 file cases, with a replacement value of approximately $2,700 were released to other agencies.

Branch of Personnel Operations.—The 1955 work in the Branch increased approximately 40 percent because of the transfer of the legal staffs from the bureaus to the Office of the Solicitor in 1954. The Branch assumed this additional load and continued to supply all normal personnel services to the Office of the Secretary and other departmental units not attached to the bureaus.

Museum.—During 1955 more than 64,000 people, including 150 special school groups visited the Museum. Regular exhibits were modernized and 7 special exhibits were prepared to illustrate current Department programs.

Branch of Central Services.—Extensive reorganizations and realignments increased the work load over 1954, but all services supplied by the Branch were kept current. Statistics for the year show 17,500 duplicating jobs, 3,000 telephone changes, 8,000 dispensary treatments, 14,000 photographs, 3,000 printing and binding requisitions, and 2,100 procurement orders for the Office of the Secretary.

Division of Budget and Finance

Sidney D. Larson, *Director*

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THE Division of Budget and Finance is responsible for staff supervision of budget and financial activities of the Department. It represents the Department in these fields in liaison with the Bureau of the Budget, other Federal agencies, and appropriation committees of the Congress.

Appropriations made to the Department by the Congress for the fiscal year ending June 30, 1955, total $434,554,250. The receipts for the period, including trust funds, deposited in the Treasury of the United States were approximately $435,600,000. This represents an increase in excess of $166 million over the actual amount deposited in the preceding fiscal year. The increase is largely due to receipts from oil leasing of Outer Continental Shelf areas.

The Division developed forms and procedures designed to provide the Secretary and Assistant Secretaries with summary budget information from which policy decisions could be made on the magnitude of programs to be included in the departmental budget. Work was continued on improvement of budget justifications submitted to the Congress and the development of program schedules for support of construction estimates of the Bureau of Indian Affairs, National Park Service, and the Alaska Road Commission.

The Division participated in the joint programs of the Bureau of the Budget, Treasury Department, and General Accounting Office for improving accounting and fiscal reporting. Accounting surveys were instituted in the Fish and Wildlife Service and the Government of the Virgin Islands for improvement of accounting procedures and financial reporting. The accounting survey instituted for the National Park Service during the preceding fiscal year was completed. Continued assistance was provided other bureaus of the Department in accounting systems improvements and other fiscal matters. Accounting principles for the Alaska Railroad were approved by the Comptroller General. An accounting manual was prepared for the Bureau of Land Management and submitted to the Comptroller General for approval.

The Division continued to cooperate with the General Accounting Office and with the bureaus of the Department in the comprehensive audit program and provided the leadership for correcting deficiencies in fiscal and other matters brought out in the audit reports.

Division of Inspection

W. Darlington Denit, *Director*

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THE Division of Inspection was established by secretarial order on March 19, 1955. This Division is responsible for the inspection and special investigation activities of the Department. The inspection program is aimed at preserving the high standards of moral and ethical conduct which have been traditional in this Department. The program was inaugurated in accordance with policy directives of the President and is seeking by means of systematic examination to evaluate the effectiveness of the regulations and procedures which control performance with respect to the conduct of employees entrusted with performance. It thus becomes an important phase of the continuing management improvement effort stressed in all Interior activities. This Division has provided policy and procedural guidelines and regulations for the inspection program. The actual inspection work is not undertaken by a centralized departmental staff, and it is a basic feature of the program that the bureaus assume full operating responsibilities. The Division will from time to time make surveys to evaluate the effectiveness of bureau inspection processes.

The investigative program covers special investigations of allegations of misconduct by employees and other administrative irregularities. Investigations of other matters within the responsibility of the Department are conducted as may be authorized by the Administrative Assistant Secretary. Where violations of criminal statutes are disclosed, cases are referred to the Attorney General for appropriate action. Cases involving certain types of irregularities are referred to the General Accounting Office pursuant to general regulations. Only limited investigative authority has been delegated to the bureaus.

This Division also provides staff assistance in the administration of the nondiscriminatory employment policy of the Department.

Division of Management Research

Arthur B. Jebens, *Director*

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THE Division of Management Research provides leadership and assists in the development of policies and programs for the improvement of management as well as conducting studies concerning organization and management in the Department. In addition the Division continued to review proposed legislation, Executive orders, and administrative issuances for organizational and management implications.

The first half of the fiscal year the Division concentrated on providing assistance to bureaus in implementing the recommendations of the Secretary's survey teams. The Division's participation consisted of devising new methods of operation, outlining new patterns of working relationships, coordinating activities so that proper organizational balance was maintained, and guiding the total effort towards conformance with secretarial intent. These activities are now virtually complete with attention now being directed to a follow-up program to examine the results achieved.

The Division undertook the establishment of a departmental manual system as a result of a recommendation contained in a report of a survey group on manuals. The overall responsibility for operation of the manual system and for review and coordination of instructions published in it was assigned to this Division by the Administrative Assistant Secretary. The process of converting all information previously issued in the Official Organization Handbook and instructions contained in Secretary's orders, as well as those instructions of general and continuing applicability formerly published in nonmanualized form, is in progress. As a part of this project the Division has initiated a plan for assisting the bureaus and offices in reexamining and rewriting their organizational statements and manual systems.

The following reflects a cross section of projects and highlights the nature of staff assistance provided by this Division. The Division, or members of the staff (1) coordinated the preparation of special reports and replies to the Commission on Organization of the Executive Branch of the Government and its Task Forces, (2) helped develop, in connection with the emergency relocation plan, a list of essential wartime functions and personnel requirements, and a plan for organizing and managing the Department, including delegation of authority necessary under attack conditions, (3) assisted the Bureau of Indian Affairs in organizational matters involving centralizing responsibilities for tribal affairs in a single unit in the Washington Office, (4) developed the operating procedures and acted as chairman for the Board of Manual and Publications for the Department in reviewing Bureau publication programs, (5) studied and made recommendations to reorganize administrative services in the Office of the Solicitor and to streamline methods and procedures in the docket room, (6) reviewed the organization for and functions of the minerals mobilization program, assisted in determining staff and fund requirements and operating procedures and methods, and prepared a document establishing the Office of Minerals Mobilization, (7) acted as chairman of a group to consider means of implementing the recommendations of the departmental safety survey report, (8) prepared secretarial instructions instituting the departmental inspection program and assisted in the establishment of the Division of Inspection, (9) established detailed procedures for, and prepared material relating to, the Department's Committee Management program, (10) and inaugurated a management bulletin, Management Highlights, for departmentwide dissemination of significant management improvement information.

The Division also implemented an aggressive campaign to obtain improved operation through superior employee performance and suggestions by assisting bureaus develop effective incentive awards programs. This included providing bureaus with information on the best incentive award practices in the Department and in private industry and by further strengthening the bureau programs through evaluation of performance. The following summary reflects the Department's incentive awards activities for the fiscal year 1955:

		Dollar savings
Number of suggestions received	1,956	$302,597
Superior accomplishment awards	110	178,882
Efficiency awards approved	5	744,700
Superior performance awards	136	7,553
Honor awards granted:		
Distinguished	34	
Meritorious	94	
Commendable	302	
Special acts	1	

Division of Personnel Management

Guy W. Numbers, *Director*

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THE Division of Personnel Management devoted itself to the overall task of maintaining the Department's personnel program at a high level of service, the success of which has been confirmed through a recent survey of a large number of field offices indicating that the current policies, regulations and procedures are meeting field needs.

The number of employees in the Department decreased from the previously reported figure of 56,831 in 1954 to 55,107 in 1955 with a subsequent reduction in recruiting activities. Governmentwide pay rate increases for beginning engineers and scientists improved the Government's competitive position with industry in recruiting for people trained in these professions.

With the change by the Civil Service Commission to a career-conditional appointment system in the competitive service, the Department adopted a similar conditional system for appointment outside of the competitive service.

The Division served as a clearing point for overseas assignments and in adjusting the Department's personnel policies and procedures in the light of a revised Memorandum of Agreement with the Foreign Operations Administration.

The sixth departmental management training program was completed by 23 trainees, most of whom were selected from within the Department. Counseling throughout the year was extended to bureaus and offices on various forms of training programs. Assistance was provided on career development programs both within the Department and cooperatively with the Civil Service Commission.

Reports of investigation of personnel cases by the Division of Inspection were reviewed and recommendations made. Grievances and appeals coming to the Department level received attention. Health and safety matters were considered and counseling, blood donation, welfare and morale-building programs of the Department were coordinated.

New performance rating regulations were issued, the most notable change being the addition of an adjective rating of "excellent," thus reducing the spread of performance evaluation between outstanding and unsatisfactory.

Reports by the Civil Service Commission of inspections in Washington, D. C., and 70 field stations were reviewed and found to meet satisfactorily the standards required.

Careful analyses of the Hoover Commission recommendations relating to personnel were made in the light of obvious possibilities of improving personnel administration.

Lists of congressional bills relating to personnel and summaries of their progress since introduction were compiled and distributed to bureaus and offices.

Division of Property Management

N. O. Wood, Jr., *Director*

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DURING fiscal 1955 the Division accelerated its activities in strengthening staff direction of the constituent bureaus of the Department, with particular emphasis on disposals of surplus and excess property, increasing the use factor on owned equipment, elimination of nonessential activities, and development of revised contracting techniques to protect the interests of the Federal Government. The staff continued to participate actively on interdepartmental boards and committees reviewing technical standards and administrative procedures, and initiated a number of internal actions designed to improve property management performance within the Department; collaborated in the preparation of initial material for those portions of the Departmental Manual governing phases of property utilization, procurement, construction contracting, and records management.

The Division placed into effect a number of new standards and revised procedures encouraging the exchange and transfer of unneeded equipment between projects and bureaus, and accelerating the release of excess equipment and stores to other agencies or departments.

A study of the contracting practices of the Department and of other agencies resulted in the development of departmentwide procedures governing the negotiation of contracts.

A number of actual field tests were conducted to determine the feasibility of contracting for commercial-type services formerly supplied by Government forces. As these tests were completed and evaluated, action was taken to establish policies controlling similar categories of activity on the basis of securing services in the most economical manner. The Division cooperated with a number of task groups, study groups, representatives of other agencies, Congress and the Commission on Organization of the Executive Branch of the Government which were studying the methods and results of property management operations within the Department of the Interior.

The preparation of a records disposal schedule by this Division helped expedite the orderly liquidation of the Puerto Rico Reconstruction Administration. The Division assisted the Bureau of Indian Affairs in negotiating with GSA for the procurement of the services of a private management firm to review and improve the entire bureau reporting system. In addition, the services of GSA consultants were obtained on a reimbursable basis for the Alaska Railroad to activate a comprehensive records management program. Disposition of inactive and obsolete records continued satisfactorily; at the end of the year there were more than 75,000 cubic feet of inactive bureau records being stored and serviced by Federal Record Centers.

During the year 279 radio-frequency assignments were issued by the Department under Interdepartment Radio Advisory Committee authorization to provide for the radio-communication requirements of the offices and bureaus of the Department. A total of 248 individual frequency assignments were registered with the International Telecommunication Union. Implementation of project CONELRAD (Control of Electromagnetic Radiation) was essentially completed. Action was taken to minimize harmonic radiation from Interior ship-station transmitters and provision was made for the identification of structures which constitute a hazard to air navigation. Studies on emergency point-to-point communication systems and radio frequency usage within the Department were completed pursuant to requests from the Office of Defense Mobilization.

Division of Security

J. Cordell Moore, *Director*

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THE Division of Security completed readjudication of all cases as required by Executive Order 10450 and at the close of the fiscal year was operating on a current basis.

During the year the Division installed a record system designed to show action taken on all cases handled by the Division including clearances issued by other agencies on Interior employees.

In the field of physical security the Division has continued its program of education on the handling of classified material and devoted considerable attention to the protection of critical facilities. Marked progress has been made in these fields despite the limited funds available.

The Division has taken an active part in the Civil Defense program of the Department and in planning for the various types of emergencies with which the Department might be required to cope. This program is being extended to the field installations and although this program is a continuing one with constant changes being the rule rather than the exception, it is believed that the Department is now in a state of readiness which will assure efficient operation under emergency conditions.

At the close of the fiscal year the Division was operating on a current basis with respect to all three phases of its responsibilities.

OFFICE OF THE SOLICITOR

J. Reuel Armstrong, *Solicitor*

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THE decision was taken during the preceding fiscal year to make the Office of the Solicitor a "departmental" law office. It was clear that this goal could not be reached solely by a reorganization of the headquarters office in Washington, D. C. As long as attorneys in the field were assigned to serve particular bureaus, they would not be in a position to offer services generally in connection with the Department's operations.

Accordingly, early in fiscal year 1955 the fundamental change in the organization of the field service required to integrate the Office completely was made. Five regions were established in the Western States, and Alaska was made a sixth region. A regional solicitor was placed in charge of each region. At various locations in each region a number of field solicitors were provided for. Hearing examiners were made administratively responsible to the regional solicitor in whose region the examiners' headquarters were located. Regional solicitors were placed under the administrative supervision of the deputy solicitor and the technical guidance of the appropriate associate solicitor as to legal matters.

As in any change of this magnitude—particularly one that drastically departs from a pattern of long standing—the reorganization of the field service has raised problems, not all of which have been resolved. Yet the results have been encouraging. The regional solicitors have been diligent in pursuing the opportunity to establish balanced regional offices and to provide adequate legal services for all of the administrative personnel in their regions. The administrative personnel of the bureaus and the attorneys in the field have been most cooperative; and neither the need of various bureaus for "legal specialists" nor the differences between the regions of the bureaus and those of the Solicitor's Office have proved as formidable obstacles as they were thought to be.

The headquarters office completed its first full year as an integrated Office. There is ample evidence that the benefits expected from reorganization are being realized, in terms of elimination of duplication in review, of greater ability to assign attorneys to meet demands upon the office, of a more closely knit performance of legal functions, and of fostering among the attorneys a feeling that they are a distinct professional group constituting legal advisers to the Department.

The considerable task of providing an efficient method of housekeeping for the entire Office has been accomplished with the assistance of the Office of the Administrative Assistant Secretary. A number of steps were taken to make the decisions and opinions of the Office much more accessible than they have been in the past. A new topical index was prepared under which are listed practically all decisions rendered and important opinions given both in the headquarters office and in the field. A cumulative index-digest of decisions and opinions is issued quarterly, and copies of opinions given in the headquarters office are regularly distributed throughout the entire office. Published decisions and opinions are issued monthly in "advance sheets" of the Interior Decisions.

Three important changes in the organization of the headquarters office were made during the fiscal year. In order to provide for a more manageable assignment of functions, the Division of Public Lands and Mineral Resources was reconstituted the Division of Public Lands and a Division of Mineral Resources was created. The Division of Appeals was abolished, and its functions were assigned to the Deputy Solicitor with the exception of contract appeals. Jurisdiction over the latter appeals was vested in a Board of Contract Appeals which was established in the Office of the Solicitor. The Board functions under regulations prescribed by the Secretary. It is composed of three members who are attorneys in the Solicitor's Office and five alternate members, four of whom are engineers in the Department. The creation of the Board has been well received by contractors and the bar.

New procedures for handling legislative reports went into effect during 1955. Views and data on bills affecting the functions of the Department are obtained from the various bureaus and offices by the Division of Legislation. Upon receipt of these comments attorneys specializing in aspects of the work of the Department then prepare reports, and the Division assumes responsibility, under the direction of the Solicitor, for the coordination and expediting of the reports. Experience during the first session of the 84th Congress indicates that the new procedures have made possible the handling of a substantially increased number of reports to the Congress and the elimination of many delays. The growing volume of requests for reports from the Congress is a continuous problem, as is illustrated by the fact that during the first session of the 84th Congress requests were received on 825 bills as compared with 680 for the 83d, and 657 for the 82d Congress.

A summary description of some of the more important aspects of the work of the Office of the Solicitor follows:

APPEALS AND CLAIMS

Some 161 tort claims, 52 irrigation claims, and 40 contract appeals were disposed of during the fiscal year. Of especial interest among the contract appeals were questions relating to the effect of a minimum wage schedule included in a contract pursuant to the Davis-Bacon Act (*Wiscombe Painting & Decorating*, 61 I. D. 423), the right to an equitable adjustment for extra work because of ambiguities or omissions in a contract (*Butler Construction & Engineering Co.*, 61 I. D. 412), the right to additional compensation and an extension of time because of the modification of a contract by an informal understanding between the parties (*Ryall Engineering Co.*, 62 I. D. 118), and a claim for water wasted in the operation of a reservoir by a departure from the established rule curve (*Georgia Power Co.*, IBCA–31). In *Arnold Streit et al.* (62 I. D. 12) prior rulings of the Solicitor holding that the provisions of a land purchase contract used by the Bureau of Reclamation barred recovery for damage to remaining adjoining lands were reversed, and the regional solicitors were instructed to reconsider all claims that had been disallowed on this ground.

Some 252 appeals in land matters were decided. Among the more important decisions rendered during fiscal year 1955 were several relating to oil and gas leasing. These included decisions holding that an applicant for a lease loses his preference right to a lease upon his failure to appeal from an erroneous rejection of his application (*Charles D. Edmonson et al.*, 61 I. D. 355); that applicants for acquired lands leases who did not comply with a mandatory requirement of the regulations because of an erroneous interpretation of the regulations by the Bureau of Land Management can be allowed a period of time to correct their applications, without loss of their priority over intervening applicants (*S. J. Hooper*, 61 I. D. 346, 350); that, in the absence of intervening rights, assent can be given after a lease expires to a suspension of operations and production in effect prior to the expiration of the lease so as to revive the lease term (*Robert E. Mead et al.*, 62 I. D. 111); and that a valid oil and gas lease terminates by operation of law when the lessee takes office as a member of Congress (*John E. Miles*, 62 I. D. 135). A departmental precedent was established in awarding all the tracts offered at public sale to one preference right claimant to the complete exclusion of another preference right claimant (*Arne Hoem et al.*, 62 I. D. 240), and in holding that a purchaser at public sale of Alaskan lands forfeits his purchase price and loses the land upon his failure to apply for a patent within the time prescribed by statute (*Matanuska Valley Lines, Inc.*, 62 I. D. 243). At the close of the fiscal year there were appreciably fewer land appeals and contract appeals awaiting disposition than was the case at the beginning of the year.

INDIAN AFFAIRS

Some progress was made in reducing the number of heirship cases awaiting disposition. Four hearing examiners were added to the staff, and the clerical staffs of all examiners were made more adequate. A noticeable improvement in the service to Indian heirs has resulted. One of the most important and complex tasks of the fiscal year was the interpretation and implementation of the six termination bills passed by the 83d Congress. Legal problems of like importance and complexity were raised by the program looking toward similar legislation for other Indian tribes, as in the Sacramento region. The matter of termination of the Government's relationship to Indians presents some of the most challenging and perplexing legal problems encountered in the Department. The regulations relating to the revision of the roll of California Indians were revised and all enrollment appeals were disposed of so that the final roll was completed in accordance with the requirements of the act of June 8, 1954. The Menominee enrollment regulations and appeals procedure, required by the act of June 17, 1954, were amended. General regulations to govern enrollment appeals under four specific acts providing for termination of Federal supervision were promulgated.

In land matters during the past year renewed emphasis has been placed upon the need for the stabilization of restricted land titles which had become fixed under previous administrations but which have been recently subjected to question on the ground of disagreement or alleged mistake by oil companies, interested claimants, and field officials of the Department. Questions which have arisen in that respect arise principally from early probates of Indian estates. The Solicitor's Office has held that it is in the public interest not to disturb property rights. Moreover, our present policy is ordinarily to refuse to waive provisions of the probate regulations which fix time limitations which have elapsed for the reopening of estates. During the year a great amount of effort was also devoted to a clarification of the lines of civil and criminal jurisdiction between Federal and State Governments. In the Tulsa region over 1,400 appearances on behalf of Indians were entered in the courts of the State of Oklahoma.

The Office was called upon in connection with upwards of a hundred cases involving Indian affairs to which the Government was a party. Of particular importance were cases involving the use of the waters of the Colorado River (*Arizona* v. *California*) and of the Rio Grande

River (*Texas* v. *New Mexico*), the allotment of waters on the Agua Caliente Reservation (*Segundo* v. *United States*), the use of ground water for irrigation on the San Carlos Reservation (*Brophy* v. *United States*), the implied right of Indians to use water on the Yakima Reservation (*Ahtanum* v. *United States*).

LEGISLATION

The first session of the 84th Congress enacted legislation (Public Law 386) authorizing the Trinity project in California. Bills providing for the Colorado River storage project and the Fryingpan-Arkansas project are still pending, as are bills providing for the "partnership" development of the John Day, Cougar, and Green Peter projects in Oregon. Project investigations in Alaska by the Bureau of Reclamation were authorized (Public Law 322). Multiple uses of the surface of unpatented mining claims are now permitted and common varieties of certain materials, such as gravel and ordinary stone, are no longer covered by the mining laws (Public Law 167). Public lands in powersite withdrawals and reservations have been opened to mining (Public Law 359). A special statute provides for the exploitation of uraniferous lignite deposits (Public Law 357). The recordation of land scrip and warrants is now required (Public Law 257). Long-term leases of Indian lands were made possible by Public Law 255. The sale of a small tract of tidelands in Alaska as a site for a large pulp mill was authorized by Private Law 153. A bill to modernize the procedures in Alaska respecting mental health is still pending.

MINERALS RESOURCES

Increased legal services were required in connection with the Department's program for expanded cooperation with State and local agencies and private persons in the conservation, development and utilization of mineral resources. Numerous contracts and cooperative agreements were prepared and processed for research projects and investigations in the minerals field. The legal basis was established for cooperation between the Bureau of Mines, the States, and the Census Bureau in the 1954 Census of Mineral Industries. Work on exploration project contracts respecting strategic and critical metals and minerals continued to be an important aspect of the business of the office. Legal services were provided in connection with the assignment to the Secretary of additional defense responsibilities with respect to metals and minerals. The promotion and enforcement of safety in coal mines entailed considerable legal work in seven important proceedings before the Federal Coal Mine Safety Board of Review. One of these proceedings resulted in a judicial decision that a State finding that a mine is gassy can be challenged only before State tribunals (*The Gauley Mountain Coal Co.* v. *Director, Bureau of Mines*). Two of these cases were pending in the Courts of Appeals at the close of the fiscal year.

PUBLIC LANDS

A considerable number of the regulations and procedures relating to the public lands were simplified and improved with the assistance of this Office. An editorial revision was made of the regulations relating to the public lands and appearing in title 43 of the Code of Federal Regulations, and certain of these regulations were completely revised. The regulations to implement the statute providing for multiple mineral development of the same tracts of public lands (Public Law 585, 83d Cong., 68 Stat. 708) were drafted and approved after extended consultation with representatives of the various mining interests. A thorough revision of the rules of practice in land matters was prepared and submitted to the public for comment. Emphasis was placed during the year in reducing the large backlog of cases involving the collection of overdue rentals in oil and gas, grazing, and other leases; the collection of trespass charges; and reimbursement for damage to public lands and resources. Many outstanding debts were collected in full or compromised or were referred to the Attorney General, or where the facts so warranted, were ordered reported to the General Accounting Office as uncollectible. Recommendations for the institution of suit were made to the Attorney General in a large number of cases, including five timber trespass cases aggregating more than one-half million dollars.

During the year the work of the Denver region was substantially increased by reason of the transfer to the field of the administration of the leasing of mineral lands acquired by the Department of Agriculture in connection with land utilization projects. Of some 7 million acres of such lands in the United States, over 6 million acres are within the Denver region. The Department's work under the Submerged Lands and Outer Continental Shelf Acts continued to present legal problems of importance. Opinions were given respecting the effect of a statute of the State of Louisiana purporting to fix the gulfward boundary of the State (M–36239), the effect of regulations under the Outer Continental Shelf Act on former State leases (M–36271), and the status of former State leases bisected by the line dividing the submerged lands from the Outer Continental Shelf (M–36259, 62 I. D. 44). Other important opinions dealt with State selections of mineral lands subsequent to 1860 under acts not expressly excepting such lands (M–36261), the availability under the Materials Act of a nonleasable mineral on lands not covered by the mining laws (M–36256), and the limitation of access to through highways crossing public lands (M–36274, 62 I. D. 158). A far-reaching opinion held that desert land entries cannot be allowed in the State of Arizona where such entries depend on percolating water for reclamation since such water is not subject to appropriation under State law as required by the desert land act (M–36263, 62 I. D. 49). In two instances, the office successfully urged that action be taken to overcome the effect of significant judicial decisions adverse to the United States. One case involved a trespass occurring under a purported lease issued by a mining claimant (*Etcheverry* v. *United States*); the other, a refusal to enjoin a railroad company from drilling for oil and gas on its right-of-way (*United States* v. *Union Pacific Railroad Company*). Neither case had been finally decided at the close of the fiscal year.

TERRITORIES, WILDLIFE, AND PARKS

In connection with the Territories the Office was called upon extensively in connection with the enactment and interpretation of the Revised Organic Act of the Virgin Islands. Matters relating to property were of particular significance during the fiscal year. A distillery of the Virgin Islands Corporation and several small tracts of land were sold and agreements were made with respect to the administration by the Corporation of property formerly under the jurisdiction of the Navy. Surface vessels and airplanes no longer needed in the operation of the Trust Territory of the Pacific Islands were disposed of and a contract executed for the salvage and disposition of certain formerly enemy-owned vessels located in the Trust Territory.

An important part of the work of the Office was concerned with international fisheries—legislation designed to protect the interest of fishing vessels of the United States in the event of seizure on the high seas, the program for research and for the control of sea lampreys on the Great Lakes, the regulation of haddock fishing by the Northwest Atlantic Fisheries Commission. Opinions of the Office dealt with the authority of the Secretary to impose limitations upon the number of boats or fishing gear with respect to particular areas in Alaska (M–36276) and to regulate fishing on the high seas under the North Pacific Fisheries Act of 1954 (M–36273).

A twofold increase in the number of purchases of land for areas within the National Park System placed additional demands upon the office for legal services in this regard. The Office assisted in bringing about a procedural innovation under which superintendents of particular areas may issue special regulations. A new approach was taken to the problems posed by the existence of private lands in national parks by proposing regulations that would make applicable to those lands certain of the laws of the States within which the lands lie. Of significance were opinions on the jurisdiction of the North Carolina State Board of Health over concessioners serving food on the Blue Ridge Parkway, the transfer of land from one area of the National Park System to another area, and jurisdiction over the waters of Jamestown Island, Colonial National Park.

WATER AND POWER

The wide scope of the Department's functions in the fields of water and power required a corresponding emphasis upon the provision of legal services essential to the discharge of those responsibilities. Extensive services were rendered in connection with the irrigation and power programs of the Bureau of Reclamation and the power marketing programs of the Bonneville, the Southwestern, and the Southeastern Power Administrations. These services covered matters relating to repayment and water service contracts under the Federal reclamation laws, the negotiation and amendment of contracts for the sale and exchange of hydroelectric power under the several statutes governing power marketing, and matters arising in connection with the procurement of materials, equipment and supplies by the Department's water and power agencies. During the fiscal year the office was called upon in connection with a number of important suits and administrative proceedings involving water rights in connection with the work of the Bureau of Reclamation. These cases are treated in some detail in the report of the Commissioner of Reclamation for the fiscal year.

CONCLUSION

The Task Force on Legal Services and Procedure of the "Second Hoover Commission" singled out this Office to observe that "A well-integrated legal staff is that of the Department of the Interior." An appraisal of the work during the fiscal year indicates that the Solicitor's Office functioned well as an integrated organization. The integrated Office was able without an increase in the legal staff to keep very nearly abreast of the heavy volume of work received during the fiscal year and in some areas, such as appeals, to reduce the number of pending cases. A good beginning was made in providing "departmental" legal services, and a sound basis laid for further improvements.

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DEPARTMENT OF THE INTERIOR

March 3, 1849

1956 ANNUAL REPORT

SECRETARY OF THE
Interior

FRED A. SEATON

March 3, 1849

The Conservation of Natural Resources

FOR THE FISCAL YEAR ENDED JUNE 30, 1956

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FOR THE FISCAL YEAR ENDED JUNE 30, 1956

UNITED STATES
DEPARTMENT OF THE INTERIOR
Fred A. Seaton, *Secretary*

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March 3, 1849

THE SECRETARY OF THE INTERIOR
WASHINGTON

My Dear Mr. President: Transmitted herewith is the annual report of the Department of the Interior for the fiscal year which ended June 30, 1956.

Activities of the Department's bureaus and offices, as reviewed in this report, indicate the progress which is being made in carrying forward your program for orderly development of our natural resources. The report also provides an evaluation of the vital effort for natural resource conservation, which is inherent in all the diverse activities and operating policies of the Department.

While much has been accomplished, we recognize that a great deal remains to be done to assure future generations a constant abundance of the natural resources which are an important portion of their heritage. We pledge our continued best efforts in striving to achieve this goal.

Sincerely yours,

Fred A. Seaton

Secretary of the Interior.

The President,
The White House,
Washington, D. C.

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PART I

THE CONSERVATION OF NATURAL RESOURCES

The Conservation of Natural Resources

"CONSERVATION" is a magic word of many meanings, but the common denominator of most definitions is the concept that sound conservation demands wise and prudent use—without either waste or abuse—of our natural resources.

Within the framework of this concept, the Department of the Interior has promulgated the policies to which it adheres in carrying out the resource programs which are its responsibility. Judicious use of our natural resources is of paramount concern to all Americans. Each succeeding generation faces the ever-present responsibility to put natural resources to their most beneficial use, all the while employing conservation practices that will assure future generations of abundant supplies for their own use and enjoyment.

Trend to Conservation

During the earlier years of our still-young Nation, many envisioned our natural resources as inexhaustible. As modern-day American society became increasingly complex, and a growing population made more and more demands upon natural resources, the view of inexhaustibility gave way to recognition of the necessity for conservation. It became clear that our natural resources supply indeed was not limitless and that appropriate conservation measures were urgently needed if current and future requirements were to be satisfied.

Thus, the trend swung from capricious disregard for conservation to a serious effort to provide for the future and at the same time derive the greatest benefit for the greatest number.

Conservation practices may vary in the sense that conservation as applied to one type of resource may not be identical to the practices employed to conserve other resources. While the modus operandi may differ, the end result spells conservation nonetheless.

In the case of resources such as timber and water, conservation calls for programs to promote renewal of the resources. Sustained-yield timber management, for example, can assure our Nation of abundant and continuing supplies of this valuable resource.

Many sections of the country already are confronted with water shortage problems, and these problems give promise of becoming more widespread and more acute in the years ahead. We still have about the same amount of water available, but we are using more of it—an increase of 24 percent from 1950 to 1955. Because this is true, the water situation rapidly is developing into one of the most critical in the natural resources field. It is becoming more and more imperative that we intensify our efforts to make better use of the perpetual supply from the heavens.

Only 17 percent of the water we have available is put to use, with about one-fourth of the water used being consumed during use; the remainder still is available for reuse.

Part of the solution may be found in more effective water storage facilities on the surface and replenishment of underground supplies, to conserve for beneficial use a greater portion of the presently unused runoff. Research is continuing meanwhile to develop economical methods of converting saline and brackish waters into fresh water. Development of large-scale, low-cost means of conversion may write a whole new chapter in this Nation's water history.

Not All Resources Renewable

All of our resources, however, are not renewable in the same sense as water and trees. Some resources, indeed, once used, are gone forever.

Because such resources as minerals and coal and oil do not renew themselves, the problem concerning them is twofold. First, we must find and develop new deposits and improve our processes for making full use of low-grade ores. Secondly, we must continue and expand our efforts to develop substitutes from those resources we have in abundance.

In both areas the Federal Government and the Department of the Interior bear grave responsibilities to aid industry in solving the problems. Increasing imports of such minerals as copper, bauxite, lead, and zinc indicate the extent to which this Nation is relying upon foreign supplies sources. A combination of increased requirements with decreasing reserves has magnified the importance of effective action to forestall depletion and to make better use of low-grade ores and substitute sources.

Thus, it is in the national interest for the Federal Government and this Department to combine forces with industry in seeking answers to many questions relating to these resources.

Our aim must also be to protect the unsurpassed beauty of our national parks, and to preserve their scenic grandeur in its original state, so far as is possible.

The basic act which created the National Park Service to promote and regulate the use of national parks, monuments, and similar reservations, declared that the fundamental objective must be to "conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Through the years the Department of the Interior has conducted its programs in the spirit of that ideal, rejecting invasions or impairment of the parks and providing for their public enjoyment in a manner that will preserve their wonders for Americans yet unborn.

Congress has provided for multiple use of our wildlife areas where this is compatible with primary wildlife values. There are some areas, however, upon which economic uses are not permitted unless such uses contribute directly to wildlife values. These areas are principally those which provide habitat for rare and endangered species and where nonwildlife use would be detrimental to the primary values.

In its assigned function as the Nation's principal resource agency, the Department of the Interior bears a special obligation to see to it that our expendable resources are conserved, that those which can be are multiplied, and that all of them contribute their full measure to the progress, prosperity, and security of America, now and in the future.

The manner in which the Department pursues the search for new and more efficient ways to utilize resource supplies, the diligence of its exploration for fresh reserves, the vigilance to resist wasteful processes, and the safeguarding of irreplaceable features of scenic beauty—all can contribute to our Nation's natural wealth and to the well-being of tomorrow's citizens.

Realistic Partnership Necessary

Sound conservation, successfully achieved, requires a realistic partnership shared by all Americans. The several levels of Government, Federal, State, and local, necessarily assume leadership in this endeavor; but the role of the private individual and groups of individuals should not be minimized. Governmental leadership should not be construed either as domination by Government or as a device to relieve private initiative from carrying out its rightful share of responsibility in furthering resource conservation.

This is a task which demands alertness from all. We must employ our best talents in working toward solution of natural resource problems for our common good.

The Department of the Interior is keenly aware of the solemn obligation upon the present generation to conserve our physical and scenic resource for our children and our children's children.

We are conscious, too, that America's high standards of living today provide ample proof that intelligent conservation and orderly development of natural resources are compatible.

The sections of this report which follow outline the specific applications of the conservation policies of the Department of the Interior—policies dedicated to the basic philosophy that our natural resources should be so administered that they may yield the greatest good for the greatest number, over the greatest period of time.

CONSERVATION OF MINERALS AND FUELS

Minerals resources are irreplaceable assets indispensable to our Nation's continued prosperity and security. A dozen years ago, many analysts were stunned by World War II's drain upon these resources. They proclaimed that we should rely heavily upon imported metals and petroleum, hoarding our own reserves for some future emergency.

Today, the Nation's mineral policy recognizes that hoarding will not assure future generations an adequate supply. This policy is founded upon the premise that wise and full use over the longest possible period of time is true conservation.

With this recognition has come acceptance of the concept that continuing technologic advance, leading to more efficient and less wasteful extraction, treatment, and use of basic materials and to the creation of new mineral commodities, is the best road to an improved domestic situation. It has brought us to a new era of industrial greatness and prosperity.

The Department of the Interior carries heavy responsibilities in furthering mineral conservation. The breadth of the field is indicated by a 1,042-page Bureau of Mines report, "Mineral Facts and Problems," published during the past fiscal year. In independent chapters, this reviews the background, outlook, and problems of 85 separate mineral commodity groups.

Best Utilization Is Objective

Recognizing that the United States must continue to rely upon imports for certain materials where our native supplies are inadequate or negligible, such as manganese, nickel, and tin, the Department's mineral conservation program cannot be aimed at complete self-sufficiency. Rather, its objective is to determine how materials, whether imported or domestic, can be utilized most efficiently and if new metals and nonmetals can be won from new or latent domestic sources, even to the extent of replacing those traditionally used.

The Department approaches this objective through several channels. It conducts research on producing metals and minerals from lower grade and more complex materials, learning more about submarginal deposits and improving techniques for utilizing newly developed materials, and recovering metals more effectively from scrap. It helps preserve and, where necessary, expand foreign sources of materials in which we are deficient. It keeps close watch on developments abroad, often aiding important foreign mineral enterprises to assure continued or improved availability of their products to the United States. It strives to create an improved environment for the beneficial investment of private capital in foreign mineral properties.

In addition, the Department works with the International Cooperation Administration to help friendly nations conserve and develop their own mineral resources, sending technologists to advise on applying advanced engineering and metallurgical principles to local problems and training foreign technologists in the Department's laboratories.

Research Coordinated

As a Government agency, the Department coordinates its research with that of private groups, whether in industry, universities, or foundations, concentrating on projects that other organizations cannot or will not undertake or cannot pursue as expeditiously. Many of its findings are basic or preliminary, since it carries its studies only to the point where it has laid a groundwork on which private groups are able and willing to build commercial enterprises. Exceptions are projects of great national interest, such as the development and temporary production of the new metals, titanium and zirconium, the Government's urgent need for which would not permit waiting for industry to develop production techniques and facilities.

Mining and Metallurgy

The Department is engaged in a broad basic research program designed to develop instruments, equipment, and methods for more efficient mining and substantially higher recovery of coal and ore. This involves field tests and observations and laboratory studies. Such research lies at the very heart of mineral conservation, since it paves the way for fuller and less wasteful use of our resources.

Light Metals Research Significant

Some of the Department's more significant recent metallurgical research has been in light metals. Investigation of low-grade aluminous materials now lying fallow has included making aluminum-silicon alloys directly from those high in silica. Economic production of aluminum, most plentiful metal in the earth's crust, from such sources would broaden our resource base immediately and solve complex supply problems.

Growing demand for steel motivates other research. Besides seeking ore-dressing methods to permit mining lower grade iron ores, this includes studies designed to reduce the 25-percent loss of nickel in treating nickeliferous lateritic iron ores and to recover the cobalt, chromium, and iron now largely lost. Demonstration that titanium can be substituted for manganese to prevent hot shortness in steel and discovery that considerable manganese and potash can be recovered from blast-furnace flue dust now wasted are among recent significant results.

Less advanced, but filled with promise, are studies of the rare earths, a group of 15 little-known metals. These are rare only in the sense that techniques for their economic separation and utilization are yet to be developed.

Fuels Technology

Our use of energy has risen steadily for years, and conservative estimates point to a further rise of at least two-thirds in the next 25 years. For the foreseeable future, the major source will continue to be fossil fuels—coal, of which our known reserves are greatest; petroleum, and natural gas, on which we have drawn for years; and oil shale, whose utilization has been brought nearer by the Department's research.

Recent studies showing that for every ton of coal mined in this country over the years, another has been left in the ground illustrate the magnitude of opportunities for conserving fuels through technologic advancement. Loss of petroleum is believed equally great, although information is much less exact. Loss of natural gas was enormous in the oil industry's youth, when gas that was produced with petroleum was wasted into the air. This loss has been reduced greatly in recent years.

Besides contributing to more efficient mining, the Department's research and factfinding have aided in technologic advancements in mechanical cleaning of coal. Determination of the technologic factors involved in mechanical cleaning has aided industry in providing the consumer with an acceptable fuel, despite the progressive deterioration in quality of mined product as a result of increased mechanization underground and the more active exploitation of inferior-grade deposits.

The Department is continuing its cooperation with industry in experimentally gasifying coal in the ground. Many difficulties have been encountered and more are expected, but ultimately this process may permit us to use coal in beds which are too thin or of too low quality for conventional mining.

Coal Conversion Studied

To supplement the naturally occurring fluid hydrocarbons and to conserve them for their highest end use, which ultimately may be preponderantly as primary chemical substances rather than as fuels, the Department studies conversion of coal to fluid fuels, both liquid and gaseous. These conversions long since have been shown to be technically feasible, but their economics are unfavorable, as yet. Accordingly, emphasis is placed on improving the economics of known processes and on developing new processes with prospect of economic advantage.

Since declining demand leading to abandonment of collieries is a major and immediate threat to our anthracite reserves, the Department is conducting research directed principally toward expanding the market for "hard" coal, bringing about more effective utilization, and developing improved mining methods to conserve reserves.

Preliminary testing indicated that heat-treating lump anthracite improves its physical properties; the treated fuel will be tested in metallurgical furnaces during the coming year.

Conservation Leadership Provided

In petroleum and natural gas conservation, the Department has exerted leadership for nearly half a century. Often called "the father of petroleum engineering," its present standing is attested by industry's financial participation in a large number of its research projects.

Many of the industry's standard production practices stem from the Department's early engineering studies. By developing technical data to assure efficient use of the energy associated with oil and gas in natural underground reservoirs, the research leads to improved methods and greater ultimate recovery.

Petroleum is more susceptible to irrecoverable loss than other resources, since between point of production and ultimate consumer it suffers varying degrees of waste and loss because of its liquid-gaseous, evaporative-explosive nature. These losses are minimized by numerous conservation precautions devised by Government and industry.

The Department encourages conservation and prevention of waste, more by suggestion than compulsion. Through administration of the Connally Act of 1935, which prohibits interstate shipment of contraband oil, the Federal Government does not regulate oil production or interfere with a State's right to do so, but does assist States in enforcement of their own laws. While this is compulsive observance of conservation, the act's greatest virtue is as a deterrent to would-be violators of conservation practices.

Cooperative Financing

For several years the American Gas Association has contributed part of the cost of fundamental research on transportation, including studies of the flow of natural gas through pipelines at high pressures and velocities, phase relationships of gas-condensate fluids, and underground storage of natural gas. The findings enable industry to reduce waste of energy and materials.

In cooperation with industry, the Department continually compiles data on the quality and characteristics of motor and aviation gasoline and diesel and burner fuels sold in the United States.

Related projects, financed partly by industry and the Department of Defense, provide data on the composition and availability of aviation and diesel fuels, stability in storage, and compatibility of like fuels when mixed.

Oil Shale Research Progressing

An 11-year research and development program, begun as a hedge against petroleum shortages during World War II, has taken oil shale to the threshold of economic utility. The research phase, which is continuing on a limited scale, has contributed significantly to knowledge of the technologic, theoretical, and economic aspects of oil shale.

This program is typical of the Department's contributions to development of new sources of raw materials to replace or supplement those that are scarce or nonrenewable; like many others, it has provided a wealth of facts that can be drawn upon when the need arises.

Helium

The Department's helium program is another outstanding example of conservation in action. It has transformed helium, a minor constituent of a few southwestern natural gases, from a laboratory rarity with no practical uses, to a strategic, industrial, and medical gas of ever-increasing importance.

Lightweight, nonflammable helium has as its oldest and still most familiar application the job of lifting airships and balloons. Its combination of unique properties, however, particularly suits it for such modern developments as shielded-arc welding, titanium and zirconium production, atomic energy, and electronics. Through research, development, and finally large-scale production, the Department has made it a valuable national asset.

A thorough study completed during fiscal year 1956 emphasized the need for saving more of the helium being lost in burning unprocessed helium-bearing natural gas. This study also disclosed that 70 percent of the helium shipped from the Department's plants is used directly by Federal agencies and another 15 percent by companies working on Government contracts.

Saving Coal From Fire and Flood

Besides its technologic research, the Department has two action programs to conserve coal reserves.

Under the first, it has saved more than 250 million tons of coal from destruction by fire during the past 7 years. The Government pays the full cost of controlling fires on its own land and requires local sources to pay half the cost of controlling those on private holdings.

The second program, designed to save anthracite reserves from loss by flooding, was authorized early in fiscal year 1956 and still is in its early stages. Under it, the Department is to contribute up to $8.5 million, on a matching basis, to the Commonwealth of Pennsylvania for the construction of facilities to control water in the anthracite formations. The Department's function is to review and approve proposed projects and inspect approved ones during construction and upon completion. Actual construction is the Commonwealth's responsibility.

Economic Data for Conservation Decisions

The complexities and rapid expansion of the Nation's economy require frequent decisions in Government and industry to prevent crippling shortages of minerals or fuels. The Department is responsible for collecting and assembling much of the economic and statistical information on which such decisions can be based soundly.

Geological Survey Stresses Conservation

The Geological Survey has long been a proponent of conservation, and will continue to sponsor or encourage all cooperative effort to this end.

Cooperation is extended to or derived from various State bodies and such Federal departments as Justice, Defense, Agriculture, Health, Education, and Welfare, and the Office of Alien Property. There is also a high degree of intradepartmental cooperation between the Bureau of Land Management, Bureau of Indian Affairs, Geological Survey, Fish and Wildlife, as well as with private organizations, industrial companies, etc. With such cooperation, the conservation of our mineral wealth is assured.

Progress Is Noted

During the past year there have been numerous examples of excellent progress.

Unitization or unit operations of a common source of supply has resulted in prolonging the life of many oil pools and has often doubled or even tripled the ultimate oil recovery from such fields. Unit operation of oil pools benefits all parties because it results in greater ultimate recovery with a minimum expenditure of money and materials. It works equally well in aid of secondary recovery when applied to waterflooding operations, pressure maintenance, gas cycling or gas injection. In fact, more often than not, secondary recovery operations would not be economically feasible except through unitization.

A solution leading to better conservation of mineral resources has been reached between the conflicting interests of oil and potash operators in southeast New Mexico through cooperative efforts of the Department of the Interior with State officials and industry. Rules have been promulgated whereby dual development of lands in the area may be accomplished with safety and without waste.

Minerals Nonrenewable

Mineral deposits unlike agricultural crops are nonrenewable. New sources of minerals and mineral fuels must be developed constantly either through discovery of new deposits or through adaptation of lower grade, offgrade, or entirely new types of materials.

True conservation of minerals therefore, means wise use of known resources backed up by a vigorous, imaginative and sustained program of search for deposits usable under current practices and conditions—plus an equally sustained and imaginative effort to develop ways in which materials not now usable can be utilized.

In the Nation's expanding economy such a program cannot remain static. It must be flexible enough to take advantage of all technologic improvements in methods of exploration, on the one hand, and to meet the challenge of shifting use patterns and enlarged demands, on the other.

Minerals Exploration Aided

The Department conducts a program of exploration for domestic sources of strategic and critical minerals.

This program plays an important part in the conservation of these resources. Under this program a continuing search is made for new sources of minerals vital to the Nation's welfare. More emphasis is placed on the search for scarcer minerals than for those in greater supply. Depending upon the mineral or minerals sought, the Government will participate in cooperation with industry, to the extent of 50 or 75 percent of the cost of the exploration work, with certain repayment provisions.

Topographic Mapping Essential

Topographic mapping has continued to be an essential part of the Department program for the conservation and development of our natural resources. During the past fiscal year some 1,800 new maps were published, and mapping projects were underway in every State of the Union, the Hawaiian Islands, Puerto Rico, the Virgin Islands, and Alaska.

Mineral Activities Accelerated on Public Lands

A marked upswing in mineral activities on both the public domain and acquired lands owned by the United States, particularly with respect to uranium, contributed to the national economy and to national defense during the year.

The Department's programs foster conservation and beneficial use of federally owned mineral resources for some 750 million acres of lands in the United States and Alaska. New procedures and regulations were promulgated to further the conservation objective in connection with new legislation enacted during the fiscal year.

WATER RESOURCES DEVELOPMENT

A major contribution toward development of a sound water policy to assure conservation of the Nation's water resources was the "Report of the Presidential Advisory Committee on Water Resources Policy."

This group, consisting of the Secretary of the Interior, as chairman, the Secretary of Agriculture, and the Secretary of Defense, submitted its report to the President on December 22, 1955. Their report, which the President transmitted to the Congress on January 17, 1956, outlines policies embodying a framework within which the Federal Government with State and local governments and other non-Federal interests may effectively develop our water resources.

The deliberations of this body led to several general conclusions and principles upon which it based its recommendations for a water policy. These are:

First, the greatest single weakness of the Government's activities in the field of water resources development has been the lack of cooperation and coordination of the Federal agencies with each other and with the States and local interests. This has been occasioned by the fact that the Federal interest in water resources development has been expressed in different laws empowering different agencies to pursue particular programs for different purposes.

Second, it is not practicable and certainly not desirable for the Federal Government alone to assume responsibility for the complete development of the Nation's water resources. This reasoning stems not only from the practical impossibility of assuming the financial burden which such a policy would require but also from the fact that such complete Federal assumption of responsibility would tend to create local and regional dependence on Federal action, to destroy individual and local initiative, to destroy the effectiveness of the government of the States, and to work a profound and undesirable change in our traditional plan of government. Lack of funds and regional rivalries have delayed for years many meritorious projects in the expectation of Federal action which has not been forthcoming.

Third, it is believed that the principle of equal contribution for equal benefits received should be applied to the beneficiaries of all Federal water resources developments, although it is recognized that historically the programs of the Federal agencies have differed widely as to the contribution required from the beneficiaries of such projects.

Fourth, and last, there has been a great controversy raging between those persons who believe they have vested water rights—property rights lawfully acquired under the laws of the States, and those who believe that the Federal Government has a superior right to all of the water in all of the streams of the United States.

Basic Data Essential

On the basis of these general conclusions, the Committee approached the overall problem by first recognizing that basic data form the foundation of any water resources policy.

The first major recommendation in the report is that the present program of basic data collection (such as streamflows, rainfall, soil conditions, hydrology, meteorology, and other factors which control the quantity, usability, and the desirability of water uses) be accelerated and be programed and carried out on a more consistent and definite basis.

The report makes clear that there is no one national water problem, but that there are dozens of problems; and that they differ from State to State and from area to area. It recognizes that a uniform national blueprint for water resources development is neither practical nor desirable; and that each area must be considered in the light of its own present and anticipated problems which can be solved only by utilizing the best collective judgment possible, as to what is most needed for the river basin, the State, the region, and the Nation.

Implementation Underway

Consideration is now being given to the implementation of the Advisory Committee's report and it is expected to provide a sound basis for the Nation's future water resources developments.

The Department has actively supported efforts to resolve water resource problems by means of interstate compacts between States having mutual problems arising from the allocation and use of interstate streams. This is in accord with the policy of encouraging a full measure of responsibility for water resource development at the State and local level.

Converting Saline Water

The increased demand for water can be partially met by conservation, but a need exists for entirely new sources of fresh water as well.

In recognition of the needs and the potential benefits to be gained from large-scale purification of saline waters, the Congress authorized a research and development program directed toward the development of processes for producing fresh water from saline and brackish waters. The resulting program of the Department has as its primary objective the development of economically feasible processes of this nature.

The Department carries out the program by sponsoring scientific research and development through federally financed contracts and grants, by some research in Federal scientific organizations, and by stimulating and coordinating private activities in this field.

Gradual progress is being made toward low-cost production. Even now, existing conversion processes compete economically with the development of fresh water sources for specialized purposes. With continued improvements in processes, steady increase in the number of uses is assured.

Saline water conversion may be expected to take the form of many different processes, of many sizes, ranging from small household stills to large municipal and industrial plants. Each serve specific uses dictated by geography and availability of saline and other water, climate, local conditions, and the value of the end product for which the water is used.

Federal Cooperation Dates From 1902

Federal cooperation with State and local agencies in wise development and use of our water resources began in 1902, when President Theodore Roosevelt approved the first Federal Reclamation Act. Some of the earliest and most successful reclamation projects are in operation today as monuments to the wisdom of that act. Among these are the Salt River project in Arizona, the Yakima in Washington, the Boise in Idaho, the North Platte in Wyoming and Nebraska, and the Newlands in Nevada. These and other projects were created under cooperative agreements by which the water users, organized into irrigation districts, contract to repay the cost of construction to the Federal Government.

Years later, the Colorado River was harnessed by construction of Hoover Dam to help meet the water and power needs of the Southwest. This world's highest concrete dam structure demonstrated the feasibility of such colossal structures and opened a new era of reclamation development.

Today, after 54 years of partnership with the water users, Federal reclamation projects are capable of furnishing water for more than 7 million acres of land through water conservation facilities in the 17 States. The facilities include 136 storage dams and reservoirs, 105 diversion dams, about 24,000 miles of canals and laterals, and about 7,600 miles of drains.

Colorado Project Notable

A notable event was authorization of the Colorado River storage project and 11 participating projects. This monumental authorization by the Congress, which was signed by President Eisenhower on April 11, 1956, will permit continued economic expansion of four Upper Colorado River States in an area of rich resources which is now virtually untapped. Coupled with the existing reclamation development in the Lower Colorado River Basin, it will ultimately establish the most complete control and utilization of the water resources of any major river basin in America. This project will supply water for

360,000 acres of land in Colorado, New Mexico, Utah, and Wyoming, and have about 1 million kilowatts of hydroelectric generating capacity.

Equally significant to the upbuilding and strengthening of the economic structure of the West was the further acceptance by the Congress in the enactment of the Colorado River storage project of the precept that development of and revenue from the sale of hydroelectric power is an essential paying partner of reclamation.

Rising Costs Foreseen

During the early decades of Federal reclamation, the simple, inexpensive projects were virtually all completed. These were the projects with the most favorable ratio of benefits to cost. Today, it is clearly evident that the unit costs of most future reclamation work will continue to rise.

Since repayment is the foundation of the reclamation program, and the cornerstone of congressional acceptance of the case for Federal development, the return by the beneficiaries of irrigation of their fair share of the cost must continue as a primary requirement. However, it seems problematical whether many major water developments of the future can be undertaken which can be completely repaid by the water user. There are a great many smaller projects with tremendous implications for the future, which the people of the West can and undoubtedly will build for themselves—often by individual or cooperative action among themselves—and, when occasion requires, in partnership with the Federal Government. Nevertheless, it is apparent that we must continue to look to power, even more in the future than in the past, as the paying partner of reclamation.

Power Programs

On June 30, 1956, the installed capacity of powerplants constructed and operated by the Bureau of Reclamation, as a part of multipurpose projects, totaled 4,974,550 kilowatts, and the capacity installed and operated by other agencies for which the Bureau is the marketing agent totaled 596,500 kilowatts—a total of 5,571,050 kilowatts.

Sale of electric power during the year aggregated 25,181,596,876 kilowatt-hours, with revenues from sales totaling $55,362,728.71.

Northwest Power Integration

The primary function of the Bonneville Power Administration s to market the electric power and energy produced at hydroelectric projects operated by the Army Corps of Engineers and the Bureau of Reclamation.

For this propose, the BPA constructs, operates, and maintains a high-voltage transmission system. This transmission grid forms the backbone system permitting the integration of both Federal and non-Federal power generating systems in the region, and allows for "pool" operation of the facilities of the major utilities in the Northwest. By means of the Northwest power pool, large blocks of power are transferred on a scheduled basis, and within contractual arrangements, between different areas in the Northwest.

The pool arrangement permits the major utilities to coordinate their operations, including the use of both steam and hydroelectric generating facilities, and thus enables the most economic use of the areas' total energy resources. The flexibility of the pool operation makes it possible to utilize the water resources in such a manner as to generate the maximum amount of prime power for the region.

Power Where Needed

The diversity of streamflows in various parts of the Northwest served by the Bonneville transmission grid makes it possible to send surplus power from one part of the area to another at certain times of the year and to reverse the process at other times of the year.

The ability of the transmission grid to supply electric energy to widely scattered parts of the Northwest makes it unnecessary to build standby steam generating facilities in those areas where streamflow conditions make hydroelectric generation inadequate for certain periods each year. This results in a reduction in the investment required for generating facilities as well as a saving of nonreplaceable energy sources such as coal, oil, and natural gas.

New generating facilities, Federal or non-Federal, when connected to the backbone transmission system serve the power loads located closest to them and release generation closer to load centers. This, in contrast to a nonintegrated system, saves the building of duplicate transmission lines, reduces the required capacity of lines, reduces powerline losses to a minimum, and thus provides more power at the load centers at lower cost to the consumer.

Coordinated Operation Useful

The coordinated operation of the main transmission grid with the generating facilities of the Federal and non-Federal generating plants permits the most economical use of water released from storage at upstream plants. This storage release is scheduled so that water may be used not only at plants releasing it from storage, but reused many times at downstream plants. Uncoordinated operation of these facilities, on the other hand, might easily mean less power available at downstream plants due to the release of storage at times when these downstream plants were not capable of utilizing additional quantities of water.

While the coordinated operation of hydroelectric generating facilities is the most important contribution which Bonneville makes to the conservation of natural resources, this operation must also take into account uses of the river for purposes other than electric power production. The operation of the power system also takes into account the minimum streamflows required for navigation and the maintenance of fishlife. Release of water from storage is designed not only for power production but also flood control and to keep adequate water in the river for navigation and fish migration and pollution abatement.

Southeastern Power Needs Met

Southeastern Power Administration's power sales contracts provide for the integration and the generation of power produced from water available from flood control projects of the Corps of Engineers of the Department of the Army in a manner which best meets the need of the area in which a particular project is located, in the light of the type and location of other power generating facilities in the area.

The Federal projects generally are operated to produce as peaking power. Energy is made available from the projects on the basis of long-range and day-to-day operational studies showing the most efficient use of available water, and the day-to-day dispatching of power available is done in accordance with the needs of the power systems into which such power is delivered.

Conservation of water resources will also result from the integrated operation of various Federal hydroelectric projects and other power systems in the Southeast. Negotiations are continuing to affect these operations.

Southwestern Power Operations

The Southwestern Power Administration operates and leases extensive high-voltage electric power transmission facilities for the integration of Federal hydroelectric power with many public and private power systems in the area to produce economy and flexibility in servicing power sales contracts. Power generated at flood control projects of the Corps of Engineers, Department of the Army, is thus integrated with other systems to secure reliable sources of electric energy for customers throughout the area.

In the interest of conservation of our natural resources, comprehensive planning is performed in connection with hydroelectric generation and other purposes for proper coordination in use of water stored in the several Federal reservoirs.

Recently, the marketing of power has been reviewed extensively by congressional committees and other interested groups. Southwestern Power Administration is engaged in striving towards meeting the objective of optimum benefits from all the Nation's resources as well as the comprehensive planning of resources development measures.

Partnership Is Guiding Policy

Partnership with the water users in the initiation, financing, construction, and operation of multiple-purpose water conservation projects in the West was a guiding policy in 1956.

A striking example of the effectiveness of this policy was the $27.5 million Ventura project in California. As a result of prompt completion of a repayment contract and the advancement to the Bureau of Reclamation in 1954 by the local water officials of $700,000 for preconstruction and design work, construction was advanced more than a year. It was the first time in 54 years of reclamation history that a repayment contract had been ready for signature on the same day that the President approved authorization of the project.

The Department was especially diligent during 1956 in its effort to transfer the responsibility for operation and maintenance of irrigation projects to the water users. With a few important exceptions, the Federal Government actually operates and maintains only the reserved work of multiple-purpose projects, while the balance of the facilities are operated and maintained by the various irrigation districts. During fiscal year 1956, the irrigation distribution facilities serving approximately 85 percent of the total irrigable acreage included in Federal reclamation projects were operated and maintained by the water users.

Recreation a Major Item

Approximately 9,858,000 persons enjoyed the use of recreational facilities on 140 reservoirs on reclamation projects throughout the 17 Western States in 1956. Estimates on expenditures at these reclamation playgrounds vary considerably, but is conservatively calculated at about $6 per day. This represents an appropriate share of investments in boats, hunting and fishing equipment, etc., traveling expenses, and food and lodging. Applied to the total number of visitors, this estimate indicates an "extra dividend" each year of approximately $59 million from reclamation.

PUBLIC LANDS

The use or acquisition of public lands by the people of the United States through the Department programs as custodian of the public domain is governed by a system of land classification which assures wise use with minimum depletion of our land resources.

Land classification and subsequent lease or disposal actions are based upon established conservation principles including that of attaining the highest and best use of lands. This requires close cooperation and coordination with a wide variety of conservation organizations, including the land management agencies of various Federal, State, and local governments, as well as the representatives of various major land users such as farmers, ranchers, owners, and lumbermen.

Of foremost consideration in the lands program is the concern for the continuing growth and expansion of the economy of the Far West and Alaska. As the Federal Government is the greatest single land custodian in these two large geographic regions, it has become incumbent to pursue a program fitted to the developmental requirements of these areas, which form a vast and vital part of the national economy.

As the demand for land intensifies, a closer look must be given to the factors which control the optimum uses for lands. Where conflicting land uses become manifest, a reconciliation of those uses must be effected wherever possible. In so striving, assessment must be given to all factors which determine the highest and best land use. Wherever practicable, and when the circumstances permit, compatible use demands are being molded to permit simultaneous multiple use of public lands.

Conservation Is Keynote

The nonrenewable nature of some of the basic land resources points up the need for continuing "minimum depletion, wise use, without abuse" conservation policies.

The technology and skills developed by the Department in evaluating various land uses and applying the principles of multiple land use, assure a well conceived and balanced program for the proper management and orderly lease or disposal of the public domain lands in the United States.

Fundamental to that program is completion of a project for modernizing the basic land records. With the aid of modern technology, wornout documents are being permanently preserved on microfilm and electronic tabulating cards to permit easy reference and the preparation of plat diagrams that will greatly facilitate record searching and use by the public as well as other agencies.

Cadastral Surveys

Adequate cadastral surveys are essential to the successful management and conservation of the natural resources of the public lands. These surveys create, reestablish, and identify the public land boundaries, indicating the limits of the lands under the Department's jurisdiction and subdividing the areas into usable economic units.

Of major importance, especially to some of the Western States, has been the stepped-up survey of school sections in those States so that they could obtain title to the lands granted to them and thus utilize the resources of those lands.

Range Management

The Department's responsibility for conservation of Federal rangelands in the United States and Alaska is of vital importance to the future of the Nation. The range livestock industry, one of the more important activities of the western range, is basic to the economy of the Western States. Closely related to this is utilization of the range for food and shelter by wild game birds and animals.

For a number of years effort has been directed toward apportionment of livestock grazing privileges to qualified range users on the basis of the best grazing capacity survey information obtainable.

Cooperation Is Seen Improved

Cooperation with the various State game agencies continues to improve with active participation by the Department in evaluation of game range grazing capacities, determination of desired populations and proper hunter licensing, and in research for improvement of wildlife habitat.

Coupled with this is the intensive range improvement and protection program which encompases: supervision of range use; protection from fire, insects, rodents, noxious and poisonous plants; and a comprehensive land treatment program.

The Bureau of Land Management has reseeded over a million acres of rangeland which will be passed on to the next generation in much more productive condition.

Forestry

The forest lands administered by the Bureau of Land Management fall into three categories: the revested O & C Railroad grant lands and other areas generally identified as O & C lands; the public domain forest lands in the continental United States; and the public domain forest land in the Territory of Alaska. They approximate 2½ million acres in the O & C area, 4½ million acres of the United States public domain, and 40 million acres in Alaska.

These forest lands comprise a basic resource having an actual value of billions of dollars. The estimated sustained allowable annual cut of sawtimber is approximately 4 billion board-feet, or about 10 percent of the annual national consumption. In addition, the woodland areas provide a permanent source of material for fuel wood, posts, poles, and other products equivalent to an allowable cut of 2½ billion board-feet per year.

Proper management of this invaluable asset dictates that the allowable annual cut (the quantity which nature and man can replace) be harvested each year in order to provide an everlasting supply of timber for future generations. Wise and judicious perpetuation of this national resource by attaining the maximum allowable harvest is the Department's responsibility. For the past 5 years, the O & C lands have been unique in that they are one of the few major forest areas under Government administration in which the actual cut has come up to the allowable cut for perpetuation of the forest, without exceeding the allowable cut.

Wherever feasible, the practice of private tree farming is facilitated and extended either by integrating the management of public domain forest with such enterprises, or by disposal of isolated tracts.

Controlled cutting, intelligently planned access roads, increasingly better protection, constantly improving forest practices, and more and more reforestation reflect proper management. These activities expedite the harvesting of salvage and overmature timber, and turn more acres over to the immature growing stock that will supply future generations with wood products, insure recreation values, and protect water supplies.

INDIAN AFFAIRS

The Department has trust responsibility for somewhat more than 39 million acres of tribal and about 14 million acres of allotted Indian lands.

Unlike public lands, these lands are the private property of the Indians with the fee title held in trust by the Federal Government. The resources involved include an estimated 3,600,000 acres of farmland, of which 860,000 acres have irrigation facilities available. Indian rangelands comprise slightly more than 44 million acres with an annual forage production sufficient for 880,000 cow units, and having an annual use value of $6,500,000.

There are about 6 million acres of commercial timber with an estimated volume of 30 billion board-feet. The value of the annual cut is aproaching $11,750,000. While the acreage of land under which minerals may be found is unknown, in excess of 5 million acres are covered by oil, gas, and other mineral leases which earned approximately $30 million in rentals, bonuses, and royalties.

Objectives

In connection with its trust responsibilities, it is the aim of the Department to assist the Indians in obtaining maximum return from the use and development of the resources consistent with sound management and conservation practices; to preserve the renewable resources in a perpetually productive state; and to build up to optimum productivity those resources where they have deteriorated.

Soil and water conservation activities are an integral part of the Department 20-year plan of soil and moisture conservation development program. During the first few years of activity in this field, the critical erosion condition of the land and the magnitude of the problem made it necessary to limit basic investigation to sites where structural and other control measures were being applied. The most pressing situations have now been met sufficiently so that attention can be given to securing a complete inventory of improvements, soil, water, forage, and wildlife resources.

Coordinated surveys have been initiated in all areas within the past 2 years. It is anticipated that such surveys will be completed within the 15-year goal set by the President for a complete inventory of the Nation's soil and water resources. Watershed, farm, ranch, and reservation development and management plans are formulated in accordance with these basic data.

Conservation Results Seen

Conservation activities and practices now being applied on Indian lands are transforming them into some of the most productive lands in their respective localities.

Over one-half of all Indian lands in the United States are included in organized soil conservation districts. Active participation on the part of land owners and operators has increased materially as a result of leadership and technical guidance furnished by the Department, as well as that furnished by State and local agencies. These activities are permitting Indians to realize an increasing amount from each dollar spent on conservation.

An analysis of the results of applying conservation practices made on 15 reservations where the program has been in effect since 1945 on 2,309,379 acres treated showed an increase in 1955 of 51.29 percent in agriculture production. This was a return of $37.97 for each dollar expended by the Federal Government. Cooperators contributed $13 for each dollar expended by the Department. Total increased production was $4.48 for each dollar of total expenditure by all participants.

Practically half of the Indian land was critically or severely eroded. In some areas approximately one-fourth of the cultivated land had been abandoned. The most severe erosion has been materially checked and the productivity of extensive areas materially improved. About 20 percent of the total estimated job has been completed.

Indian Range Management

The management of Indian rangelands during 1955 was high-lighted by the development of new grazing regulations for the Navajo Reservation after several years of consultation with tribal representatives. The regulations place considerable responsibility in central and district grazing committees in administration of grazing permits which provide for the conservative use of the Navajo range.

Irrigation Development Essential

Agricultural development by irrigation on most of the reservations in an arid and semiarid West constitutes an important opportunity whereby Indians may become self-supporting and make proper use of their lands. The continued development of Indian irrigation projects is essential to preserve the water rights appurtenant to the reservations which have been established by treaties or other Federal enactment.

Indian irrigation projects create wealth in the same measure as do reclamation projects, but are constructed primarily for the benefit of the resident reservation Indian families.

Thus they serve in part to discharge the obligation of the Federal Government to the Indian people in promoting their welfare toward true equality with their fellow Americans.

Indian Forest Management

A very important resource requiring full-time conservation efforts and wise use are the Indian forests. These forests are working forests in the sense that they are expected to make their full contribution to the economic welfare of the Indian owners.

The primary objective in managing these forests is to provide a continuing harvest of usable wood products. There are also the collateral objectives of watershed protection, forage production for grazing purposes, the development of fish and game resources, and the preservation of scenic and recreational values.

In recent years, a few Indian tribes have authorized the use of tribal funds to finance inventories of their timber resources. These inventories, based upon modern techniques of aerial and ground surveys, have supplied the information required for a more exact determination of allowable cut under sustained-yield management.

The results have been impressive. On the Navajo Reservation, for example, logging operations have formerly been restricted to a maximum cut of about 14 million board-feet a year, because the meager data available regarding the forest did not justify any larger scale operations.

A careful inventory, begun in 1952, revealed that the annual cut can be increased safely to 28 million board-feet. This doubling of the annual cut has been approved, and plans are nearing completion for putting it into effect.

There is reason to believe that the time is approaching when all Indian forests will be making their full contribution to the economic welfare of the Indian owners, and to the stabilization of dependent wood-using industries.

Mineral Development Encouraged

In addition to the surface resources, Indians also possess considerable wealth in oil, gas, and various other minerals. Indian tribes and individual Indians are encouraged to lease their trust land for oil and gas and other mineral development with the aim of obtaining a maximum recovery and income consistent with a sound conservation program.

Conservation is promoted by providing for mineral development under leases, the terms of which authorize supervision of operations and cooperation with the lessees in proceeding with development.

Under the terms of the leases, if the Secretary believes that economic conditions are unsatisfactory, he may authorize mining lessees to suspend operations for definite periods. Oil and gas leases contain specific provisions requiring the lessees to abide by any act of Congress or order or regulation concerning conservation. Regulations have been promulgated governing oil and gas operations. These leases also provide that the Secretary of the Interior may impose drilling and production restrictions in the interests of conservation and he may take into consideration among other things Federal and State laws, regulations, rules, and lawful agreements.

Unit Development Frequent

As a conservation device Indian lands under oil and gas leases are frequently included in approved unit development agreements along with lands owned by other individuals and also lands owned by the State and Federal Governments. The lands included in the agreements are operated as a single unit without regard to separate ownership.

The planned drilling program authorized in the agreements results in the economy of drilling fewer wells, conservation of the gas energy and higher ultimate recovery.

Where conditions warrant, authorizations are given for the injection of air and gas in the oil sands for repressuring. Likewise, under proper conditions, agreements are approved for secondary recovery under waterflooding programs.

THE NATIONAL PARK SYSTEM

The existence of the national park system is proof that the American people believe that the best use to be made of the finest of the Nation's natural scenery and the most significant of its historic and prehistoric resources is to give them the fullest possible degree of protection, and to devote them to the inspiration and enjoyment of present and future generations.

The Congress has repeatedly made it clear that this kind of management was to be applied to these great possessions of all the people of the United States.

The national park system contributes tremendously to present-day needs of the American people. This is shown conclusively by the steady and rapid increase in volume of patronage, up nearly 150 percent since World War II, to more than 50 million visits in the calendar year 1955. The increased rate of use is even more rapid the first half of the 1956 calendar year.

As expanding benefits of our thriving national economy provided increasing millions of Americans with the leisure time and the means to enjoy the great inspirational and cultural resources of our park system, grave problems involving the conservation of those resources arose.

So it was that, a year and a half ago, it became apparent that increasing park use, accompanying changes in American vacation and travel habits and requirements, necessitated a complete new look at the development, staffing, and adequacy of the park system to meet the challenge it faced.

Mission 66

Out of this study emerged a bold and comprehensive long-range program designed to provide the American people with a park system adequate in all ways necessary for their enjoyment and inspiration. This program is scheduled for completion in 1966—the golden anniversary of the establishment of the National Park Service. It is known as Mission 66.

In February the program was submitted to the Congress with the firm endorsement of President Eisenhower. The President informed Congress that "Unless vigorous action is taken, many Americans visiting the parks will be frustrated in gaining the scenic and educational benefits they seek and deserve."

Congressional approval of the objectives of Mission 66 was evidenced in the 1957 appropriations which provided the National Park Service with $68,020,000, an increase of $19,153,700 over 1956 appropriations.

Advance planning permitted an immediate start on a number of Mission 66 projects and tangible evidence of the program's benefits will begin appearing in the parks next summer. The program calls for substantial annual increases in Service appropriations to overcome longstanding deficiencies and to make possible the effective use and satisfactory maintenance of the additional facilities which will be provided.

A Program of Conservation

Although considerable construction will be required to provide the campgrounds, interpretative facilities, roads, trails, lodges and maintenance facilities, Mission 66 essentially is a program of conservation. Preservation of the wilderness qualities and primitive settings which give precious meaning to the existence of our parks and national monuments is a paramount goal of Mission 66. By providing facilities which discourage overcrowding and permit fuller understanding, the park system can benefit greater numbers of people and still be passed on unimpaired for the enjoyment of future generations.

The conservation character of Mission 66 is emphasized in all phases of the program which fully recognizes the need for alertness to prevent any damaging impact on the superlative feature of the national park system.

The problem of providing healthful outdoor recreational facilities extends well beyond the national park system. The rapidly increasing population and the consequent shrinking of undeveloped areas require the provision of a greatly expanded system of public recreation areas throughout the States and Territories. This calls for understanding cooperation between Federal, State, and local governments.

Recreation Plan Provided

An important facet of the Mission 66 program is the provision for developing by 1961 a national recreation plan and to cooperate with other Federal, State, and local agencies in meeting the growing need for additional recreation facilities.

Even before funds for starting the national recreation study became available, the Service with a limited staff assisted the States and Territories on 350 occasions on a wide variety of park and recreation programs.

Development of the Mission 66 program was a venture in which all employees of the Service, regardless of rank, were invited to contribute ideas and suggestions. It represents a distillation of the contributions of literally hundreds of men and women, who saw in it promise of a remedy for conditions which were threatening—which had, indeed, already resulted in serious damage to—priceless and irreplaceable resources.

As originally conceived the program represents the best estimates of the men closest to our parks and monuments of the needs of the system in the years ahead. Mission 66 was conceived, however, as a dynamic, flexible program which will require adjustments from time to time to keep abreast of changing costs and variations in the visitor travel pattern.

New Areas Established

The national park system was enlarged and strengthened in numerous ways during the past fiscal year. Two new areas were established—Cumberland Gap National Historical Park, in Kentucky, Tennessee, and Virginia, and Fort Union National Monument in New Mexico.

Pending as the year closed and subsequently enacted were bills authorizing establishment of the Virgin Island National Park on the Island of St. John in the Caribbean; Pea Ridge National Military Park, Ark.; and Horse Shoe Bend National Military Park, Ala. Zion National Monument and Zion National Park were incorporated into a single national park.

Some 46,000 acres of private holdings within the boundaries of national park areas were acquired during the year by purchase, donation, or exchange.

Thus as the fiscal year ended and Mission 66 was launched, the national park system embarked on what promises to be the most rewarding era in the history of the National Park Service.

FISH AND WILDLIFE RESOURCES

To keep pace with the inroads which industrial and agricultural progress is making on the fish and wildlife resources of the country, the Department continued to expand its programs to assure sound conservation, full development, and wise use of these resources.

The policy is based primarily on the concept that conservation is concerned as much with the proper utilization of the fish and wildlife resources as it is with their protection, since the maximum value to the Nation of these renewable resources comes only when they are fully utilized, consistent with good management.

Pursuit of Facts Important

Any intelligent program of natural resource management, therefore, is constantly in pursuit of facts. Facts are needed to establish management procedures permitting full realization of maximum production. Facts are necessary to establish annual population levels and to show the portion of such an annual population that can be harvested without detriment to the capital stock. Thus, basic research becomes the foundation of the Fish and Wildlife Service's operational activities.

Fishery Biological Research

Fishery biological research is largely concerned with reaching explanations of fluctuations and with using such understanding for the benefit of fishermen and good management of the resource. What now seem to be capricious changes in fish behavior, or overfishing, or mismanagement, but which probably are interrelated effects of changes in climate, currents or flows, food, predation, disease incidence, and fishing effort, will be understood when many skills and specializations are brought to bear upon the forces which affect fish.

With fuller understanding through research will come fuller realization of true conservation. For many species it will be possible to direct fishing to take fish at the time in their lives—considering growth rates and mortality rates—when the yield is greatest, and to deploy fishing time to encourage the most profitable and productive balance among fish stocks.

With more knowledge gained from research, fishery conservation will move closer and closer toward the concept of true fish husbandry—wise use, maximum sustained yield, and greater productivity.

Development of the Commercial Fisheries

The marine fisheries are a vast resource, capable of considerable further development. It is the Department's responsibility, through its commercial fisheries program, to explore and develop this potential national wealth and at the same time seek the wisest utilization of the resource which insures its conservation for future generations.

Exploratory fishing and gear research is directed towards the most efficient utilization of the nation's fishing resources. Deepwater and distant-water explorations have developed new potential resources, thereby widening the scope of opportunity for the present fishing fleet. This also results in reduced fishing pressure for presently heavily fished areas, thereby aiding in conservation but not reducing the total output of the commercial fishing industry. Applied research on fishing gear function has resulted in methods to harvest fish and shellfish in new fishing areas.

Restoration of the Alaska Salmon Fisheries

Because of the depleted condition of the pink salmon runs in southeastern Alaska and Prince William Sound, a vigorous restoration program was initiated in 1954 and continued in 1955. This consisted of complete closure of the pink salmon fishery in Prince William Sound, and a reduction in trap fishing effort by 50 percent in southeastern Alaska coupled with large increases in closed areas in various bays to reduce purse seine catches.

This program of reserving a large proportion of the runs for spawning stock resulted again in generally satisfactory escapements of pink salmon from which larger future runs can be expected.

The Bristol Bay red salmon restoration program of recent years also began to pay dividends in 1956, and much improved runs appeared in the major districts, yielding 50 percent larger catches than the parent year, and at the same time providing an adequate seeding of the spawning grounds.

Wildlife Habitat Research

If wildlife is to survive and continue to perpetuate itself, it must have adequate habitat. This required food and cover is affected by the use man makes of the land.

Increasing human populations which require more food, more building materials, and more intense use of the land cause radical changes in living conditions for wildlife. Wild animals, however, are tough and resilient and can respond and acclimate themselves remarkably well to certain of these changes. In recent years, for instance, wildlife investigators have found that wildlife can withstand much heavier hunting than was previously thought possible.

To obtain these facts for the basis of an efficient management program, some 80 wildlife biologists are stationed throughout the United States and Alaska engaged in research on a wide variety of species and problems.

River Basin Studies

Development of the Department of Agriculture's soil bank program has opened up new opportunities for the preservation and enhancement of wildlife habitat throughout the country. The Fish and Wildlife Service has taken an active part in planning for the implementation of this program to assure that full consideration of measures to improve wildlife habitat is included in the policies and practices established for the program.

The nationwide wetlands preservation and development program made considerable progress during the past year. Cooperative preservation programs with numerous State fish and game agencies got under way. Several committees, both statewide and regionwide, were set up to create greater interest in wetlands.

Federal Aid Restoration Programs

In the sport fishery field under the Dingell-Johnson program, many new impoundments were created and stocked to provide more recreational opportunities for the millions of Americans who annually search for good fishing spots.

Means by which productivity of both the manmade and natural fishing waters could be increased were the subject of a wide variety of research spread across the country.

Wildlife restoration operations under the Pittman-Robertson program were varied and highly productive. Field surveys and investigations stressed the assembling of information that was used to set open seasons and bag limits to insure the most effective cropping of game bird and mammal surpluses.

National Wildlife Refuge Program

Two new national wildlife refuges were placed under administration during the past year. This was made possible by the secondary use of two flood control reservoirs which were secured by agreements from the Corps of Engineers, Department of the Army.

One of these new refuges, the McNary Wildlife Management Area, is on the Columbia River in Washington; the other, the Snake Creek National Wildlife Refuge, is on the Garrison Reservoir in North Dakota.

Nearly 1,500 acres were purchased in fiscal year 1956 for the Quivira National Wildlife Refuge in Kansas. This refuge was established in the preceding year because of the need for a waterfowl wintering area in that part of the Great Plains.

Management of Migratory Waterfowl

Several years ago the management of migratory birds entered a new era with the establishment of organizations built around the four flyways which in turn are the management units for most migratory birds.

Beginning primarily as an organization including administrative heads of the respective State conservation departments, each of the flyway organizations has since developed within their ranks technical committees composed of trained personnel from all 48 States. The Service has given leadership to these research crews through the appointment of a representative in each of the four flyways.

Controlling Predatory Animals

The control of destructive animals is frequently necessary to maintain populations of these wildlife species at a level where their numbers will not be in serious conflict with human interests.

Operations to accomplish this were conducted during the year on both public and private lands to reduce losses to livestock and game caused by wide-ranging predatory animals. The work also included measures taken for the suppression of various forms of field rodents destructive to agricultural crops, horticulture, irrigation structures, timber production, and range vegetation.

The economic livelihood of many persons engaged in the utilization of these resources is dependent upon keeping losses from all causes at a minimum.

Maintaining the Inland Fisheries

The Fish and Wildlife Service cooperates very closely with the States and other agencies of the Federal Government in the maintenance of the inland fisheries in all parts of the country.

It is Federal policy to aid the States wherever and whenever it is necessary to maintain and preserve game-fish populations. Studies are conducted on large management areas to obtain information on fish habitat, environmental factors affecting reproduction and carrying capacities, and on wise utilization of the fishery resource.

The operation and maintenance of 91 fish hatcheries is an important part of the program. The fish produced at these hatcheries are distributed to areas where the restocking of waters is most urgent and to the States for supplementing programs as necessary.

Foreign Activities

The work of the several international fishery commissions of which the United States is a member continues to demonstrate the usefulness of this type of organization as a means for bringing about cooperation between governments.

Broadening this system to deal with yet unsolved problems, the United States and Canada established during the last year a new organization known as the Great Lakes Fishery Commission.

An equally important function is the promotion and coordination of general fishery research in the Great Lakes to obtain information which will enable the two Governments to assist the commercial and sport fishermen in solving problems which have plagued them for years.

CONSERVATION IN THE TERRITORIES

The story of conservation in the Territories can best be told in terms of cooperative action rather than through separate consideration of the work of individual bureaus of the Department. It is a story which largely concerns Alaska. While both Hawaii and Puerto Rico have larger populations and more land in current use, neither can compare with our great northern Territory in those natural resources which are the Department's special province.

The Department's conservation responsibilities are not, however, confined to Alaska. In the Pacific the Department's Office of Territories often deals directly with conservation problems since in American Samoa, and particularly in the Trust Territory, it exercises direct governmental functions.

Resource Important to Living Standard

In these areas land resources, while meager, are all important to islander standards of living. The Department is therefore greatly concerned with the conservation and use of island agricultural lands, not only for the production of tropical crops such as coconuts, taro, breadfruit, cocoa and coffee, but also for truck crops and livestock as well.

In the Virgin Islands the scarcity of fresh water makes the conservation of water resources a major problem. Here the Virgin Island Corporation has been engaged for a considerable period in a program of building small dams to impound surface runoff. Those completed to date have an impounding capacity of over 400 million gallons. This program has had an invaluable effect in raising water tables and thus increasing the availability of well water. VICORP is also engaged in both land clearance and reforestation activities and operates a livestock improvement program.

Hawaii Requires Little Aid

In the Hawaiian Islands resources in sugar and pineapple land and in scenery and climate, which have made tourism a major industry, are the prime concern of the Territorial Government and little Federal assistance is needed.

The National Park Service contributes to the conservation of the scenic wealth of Hawaii by maintaining the Hawaii National Park on the Island of Hawaii and Maui.

Emphasis on natural resources should not overshadow a most important Department function of helping to conserve resources in human beings in areas under its jurisdiction. Through active and often direct promotion of Territorial health and education programs, and through a program of training islanders in the difficult art of self-government, the Department is increasing both the significance and the usefulness of its other conservation activities.

Greatest Effort in Alaska

While the conservation programs described previously are all important to the people whom they affect, they are dwarfed by the conservation effort of the Department directed toward Alaska.

In that magnificent region, one-fifth as large as the area of the States, currently used natural resources—fish, fur, minerals, coal, forests, and water—produce a great deal of Alaska's annual income, while currently unused resources constitute a tremendous storehouse of wealth for the future.

The Federal ownership of all but an insignificant percentage of Alaska's land greatly magnifies Federal responsibility for these resources and also affords a dramatic opportunity for the Federal Government to transform conservation philosophy into practical down-to-earth realities.

Seal Herd Restored

What can be accomplished in this respect has been demonstrated impressively in the Pribilof Islands, home of the fur seal. Once under Russian ownership and once again after Alaska was purchased by the United States, unrestricted commercial exploitation all but exterminated the Pribilof Island seal population.

A combination of international cooperative control measures, protection of the rookeries and of seals in the open sea, and strict control over the number of seals taken each year, has brought the herd back to its former abundance. Not only have the fur seals been saved from extinction but the Federal Government now grosses over $3 million annually from the sale of skins.

Salmon Problem Difficult One

The salmon of Alaska represent the Territory's most important and most difficult conservation problem. The current year provides a bright exception to a long-term trend of decline in the size of the salmon pack.

The annual wholesale value of the pack, even in a relatively poor season, is more than $60 million, an amount which is certain to be exceeded by the time all the returns are in for 1956.

The Department's program of salmon conservation measures includes control over fishing gear, control over fishery waters and over the periods during which fish may be caught, protection of spawning salmon, the destruction of predators, an intensive research program, and cooperation with the Territorial Department of Fisheries in all phases of salmon research and conservation.

The place of fish traps in a conservation program is still a matter of great controversy in Alaska.

Irrespective of the conflict between those who regard fish traps as having economic rather than conservation significance and those who hold the reverse of this view, it is obvious that strict control of the use of fish traps is essential to any salmon conservation program. This conclusion represents a major premise in the Department's efforts to protect the salmon runs. Thus, the Department has substantially reduced the number of fish traps in many areas of Alaska.

Sport Fishing Controls

The work of the Fish and Wildlife Service is also of great importance in protecting sport fishing as well as Alaska's great wealth in wildlife, including fur-bearing animals. Both sport fishing and hunting constitute fascinating attractions to the visitor to the Territory and the resource could not be maintained without careful control measures.

The Alaskan moose represent a prime illustration of the success of wildlife conservation. Their numbers have increased and their range has extended northward. This has been accomplished by strict control of hunting, by the establishment of game refuges, and by the control of predators of which the wolf is the most dangerous. Each season sees hunters get their quota of these handsome but vicious animals.

Wise Use Emphasized

Even more important to the economic development of Alaska are the Department's conservation measures in connection with coal, minerals, oil, forests, and hydroelectric resources. It is axiomatic that wise use and conservation of these sources of much of Alaska's wealth are but opposite sides of the same shield. Because many of the natural resources of the Territory remain to be developed, wise use is often the most important side of this shield.

The Department, through its railroad and highway building and maintenance activities, also makes possible both wise use and conservation in areas that, without these means of transportation, would remain inaccessible to economic development.

Petroleum Development Noted

Petroleum is still a relatively unknown quantity among the Territory's natural resources. The Department's leasing program is encouraging a widespread and responsible search for oil. With an eye to future conservation requirements, a development contract was secured during the year, covering 1,200,000 acres in 470 Federal land leases in the Icy Bay-Cape Fairweather region of Alaska.

Power Sites Surveyed

An auspicious beginning has been made in the appraisal and conservation of Alaska's water and hydroelectric resources. Intensive surveys of many potentially valuable water power sites have been made. Some, like the Eklutna project near Anchorage, are already adding to Alaska's wealth through production of electricity.

It is apparent from this consideration of the Department's conservation programs in Alaska that the Territory is providing a unique opportunity for a demonstration of the effectiveness of the partnership principle, both in extracting wealth from Alaska's natural resources and in conserving them for the wealth they will provide in the years to come.

PART II

ANNUAL REPORTS OF THE BUREAUS AND OFFICES OF THE DEPARTMENT OF THE INTERIOR

Office of the Assistant Secretary

Water and Power Development

Fred G. Aandahl, *Assistant Secretary*

THE ASSISTANT SECRETARY for Water and Power Development discharges the duties of the Secretary with respect to the Department's programs in the field of water and power development. In this connection, the Assistant Secretary exercises secretarial direction and supervision over the Bureau of Reclamation, Bonneville Power Administration, Southeastern Power Administration, and Southwestern Power Administration. The principal function of the latter three agencies is to market surplus power generated in their respective areas at Federal projects. The Bureau of Reclamation constructs water-use projects whose primary purpose is the reclamation of arid and semiarid lands in the West, and also markets surplus power produced at Federal projects in the West outside the boundaries of the Bonneville Power Administration and Southwestern Power Administration. The Assistant Secretary for Water and Power Development is also responsible for carrying out the defense functions of the Secretary with respect to electric power and for supervising and directing the Office of Saline Water. The activities of the water and power agencies of the Department and the Office of Saline Water are more fully described in sections of this report covering each of the Department's bureaus and offices.

The table on the next page, prepared on a consolidated basis for fiscal year 1956, shows the installed capacity of plants whose power is marketed by Interior Department agencies, net energy generation, energy marketed, and gross revenues.

The Assistant Secretary for Water and Power Development participated in the negotiation of contracts for the marketing of power in the operating areas of Southwestern Power Administration and Southeastern Power Administration. Negotiations were completed and a

Power marketing data, fiscal year ended June 30, 1956

Marketing agency	Installed capacity (as of June 30, 1956) (kilowatts)	Net energy generated (million kilowatt-hours)	Energy marketed (million kilowatt-hours)	Gross revenue (thousands of dollars)
Bureau of Reclamation	[1] 5, 571, 050	25, 814	[4] 10, 759	[5] 39, 233
Bonneville Power Administration	[2, 3] 1, 910, 000	13, 102	25, 970	60, 993
Southeastern Power Administration	[2] 1, 031, 000	2, 110	[6] 2, 248	11, 445
Southwestern Power Administration	[2] 501, 000	938	[6] 1, 493	8, 183
Total	9, 013, 050	41, 964	40, 470	119, 854

[1] Includes 565,000 kilowatts in Corps of Engineers, 31,500 kilowatts in International Boundary and Water Commission, and 4,974,550 in Bureau of Reclamation projects.

[2] Capacity in Corps of Engineers projects.

[3] Bonneville Power Administration also markets power from Bureau of Reclamation Grand Coulee, Hungry Horse, and Chandler powerplants with a capacity of 2,271,000 kilowatts. (This amount included in Bureau of Reclamation installed capacity.)

[4] Excludes 14,423 million kilowatt-hours delivered at Grand Coulee, Hungry Horse, and Chandler powerplants by Bureau of Reclamation to Bonneville Power Administration. (This amount included in Bonneville Power Administration energy marketed.)

[5] Excludes $16,129,430 revenue received by Bureau of Reclamation from Bonneville Power Administration. (This amount included in Bonneville Power Administration gross revenue.)

[6] Includes purchased energy.

sales, wheeling, and firming-type agreement for marketing of the remaining one-third of John H. Kerr project power was signed on December 7, 1955, with the Carolina Power and Light Co. to serve preferred agencies in North Carolina. Negotiations were also completed and a three-party arrangement for sale, wheeling, and firming was signed on May 16, 1956, with the Georgia Power Co. to serve preferred agencies in Georgia for the marketing of one-half of Clark Hill project power. Service to preferred agencies in Georgia was initiated on June 20, 1956. In the Southwest, at the direction of Congress, 4 inoperative lease-operate-with-option-to-purchase transmission agreements and 4 companion power sales and exchange agreements with generation and transmission cooperatives were reactivated. Negotiations were conducted to remove the option-to-purchase provision and to have operation performed by the cooperatives.

The Assistant Secretary for Water and Power Development directed a review of cost allocations and power rates for certain projects in the Southeast and Southwest. In the Southwest, a proposed upward adjustment of the average rate level for firm power was the subject of extensive review by the Congress and other interested agencies. The existing interim rate has been extended by the Federal Power Commission on a temporary basis. Studies indicated the necessity of an increase to provide repayment of the Federal investment in production and transmission facilities allocated to power on a 50-year basis with 2½-percent interest.

As a part of the partnership program approval was given Bonneville Power Administration to enter into long-term firm contracts with non-Federal generating utilities for transmission of power over the Federal transmission grid in the Northwest. In order to obtain full regional integration and to secure the most economical use of resources, Bonneville Power Administration will build feasible additional transmission facilities as needed. Reimbursement will be on a use-of-facilities basis.

During the fiscal year ending June 30, 1956, the Department through the Assistant Secretary for Water and Power Development reviewed 31 reports of the Corps of Engineers, Department of the Army, concerned primarily with flood control and navigation, and 34 applications for permits and licenses referred to the Department by the Federal Power Commission. Total construction costs of these projects is estimated at over $2.4 billion. The desire of non-Federal agencies to participate in the Federal Government's partnership program continues to be evidenced by the large number of applications for licenses to the Federal Power Commission to construct hydroelectric projects. The total estimated construction cost of applications for licenses reviewed by the Department during the year is estimated at over $1.3 billion. A number of statutory provisions assure special consideration of Interior Department interests. In presenting its views to the Commission, the Department has taken the position that non-Federal development of hydroelectric power resources is desirable where such development is consistent with the public interest and, to the extent necessary, the Department has recommended special provisions which would safeguard the public interest and insure coordination with overall river basin programs.

The Assistant Secretary for Water and Power Development served as departmental representative on the Interagency Committee on Water Resources and on the President's Advisory Committee on Federal Public Works. Staff of the office served as departmental representatives on interagency committees concerned with radio frequency allocation, turbine procurement, international water developments, public works planning, coordination of water resources projects, cost allocation, financial practices, economic analysis, atomic energy, and similar subjects.

Other significant activities of the Office of the Assistant Secretary for Water and Power Development during the 1956 fiscal year included coordination of studies on Canadian-United States reservoir storage and hydroelectric projects and initiation of review of the Hetch Hetchy power operation of the city and county of San Francisco, Calif. An economic analysis of the Missouri River Basin completed by the Bureau of Reclamation was discussed with concerned congressional and State interests. Reappraisal of certain irrigation benefits was initiated with the cooperation of the Department of Agriculture.

BUREAU OF RECLAMATION

Wilber A. Dexheimer, *Commissioner*

Introduction

EFFORTS of the Federal Government in cooperation with State and local agencies and private interests in the Western United States resulted in major progress in planned development and use of our water resources during 1956 fiscal year.

The Bureau of Reclamation added irrigation facilities to serve 203,000 acres of land with a new or supplemental supply of water and provided 120,000 additional kilowatts of hydroelectric generating capacity in multipurpose dams.

About $160 million was added to the Bureau's $2.6 billion investment in western projects through completion of these and other irrigation and power features.

Partnership with the water users in the initiation, financing, construction, and operation of multiple-purpose water conservation projects in the West was a guiding policy in Bureau of Reclamation administration in 1956. A striking example of the effectiveness of this policy was the $27.5 million Ventura project in California. As a result of prompt completion of a repayment contract and the advancement to the Bureau in 1954 by the local water officials of $700,000 for preconstruction and design work, construction was advanced more than a year. It was the first time in 54 years of Reclamation history that a repayment contract had been ready for signature on the same day that the President approved authorization of the project.

Another notable feature is the steadily increasing use which is made of reclamation facilities by seekers of recreation. Last year more than 10 million persons visited water playgrounds in the arid West made available on Reclamation projects through cooperative administrative arrangements between the Bureau, the National Park Service, the Forest Service, or State recreational agencies.

Bureau of Reclamation reservoirs rendered extraordinary service during the year in helping to control floods from heavy spring snowmelt in several States. In Washington, Idaho, and Oregon, particularly, the runoff of most streams of the Columbia River Basin was of flood proportions and storage in Bureau reservoirs prevented several local disasters as well as reducing the flood crest of the Columbia River. In California, flood control regulation of releases of water was required in varying degrees at all of the Bureau's 12 reservoirs but one—Cachuma.

The total harvest from all Reclamation projects in calendar year 1955, which included one-half of the 1956 fiscal period, was valued at over $827.7 million, an average of $132.18 per irrigated acre. This was the fifth consecutive year in which the total crop value exceeded the three-quarter-billion dollar mark, increasing the cumulative value of all Reclamation harvests through 1955 to more than $11.3 billion.

The Bureau of Reclamation has been especially diligent in its effort to transfer the responsibility for operation and maintenance of irrigation projects to the water users. With a few exceptions, the Bureau actually operates and maintains only the reserved works of multiple purpose projects. The balance of the facilities are operated and maintained by the various irrigation districts. During fiscal year 1956, irrigation distribution facilities serving approximately 85 percent of the total irrigable acreage included in Federal reclamation projects were operated and maintained by the water users.

A notable event of the year was authorization of the Colorado River Storage Project and 11 participating projects. This monumental authorization by the Congress, which was signed into law by President Eisenhower on April 11, 1956, will permit continued economic expansion of four Upper Colorado River States in an area of rich resources which is now virtually untapped. Coupled with the existing Reclamation development in the Lower Colorado River Basin, it will ultimately establish the most complete control and utilization of the water resources of any major river basin in America.

To undertake the design and construction of features of the Colorado River storage project and other new projects in fiscal year 1957, as well as proceed with engineering activities on projects under construction, the Bureau strengthened its staff by several administrative changes, undertook recruitment of new engineering personnel, largely from university graduates, and streamlined procedural techniques for greater efficiency and economy of operations.

IRRIGATION AND CROP PRODUCTION

During fiscal year 1956, the Bureau of Reclamation was responsible for overall supervision of the care, operation, maintenance, and replacement of facilities capable of delivering irrigation water to more than 7½ million acres of land—more than one-fourth of the total irrigated land area of the Western United States.

These facilities included 136 storage dams and reservoirs, 105 diversion dams, almost 24,000 miles of canals and laterals, and almost 7,600 miles of drains.

Crop Production

The total harvest from all Reclamation projects in calendar year 1955 was valued at over $827.7 million, an average of $132.18 per irrigated acre. Irrigable lands for service totaled 7,367,735 acres, of which 6,261,761 acres were actually irrigated. As compared to 1954, this represents an increase of 135,995 irrigated acres.

Forage crops were produced on 52.6 percent of the net area irrigated on all Reclamation projects, and 25.3 percent of the irrigated lands were utilized in producing cereals. The crops within these two groups, totaling more than 14.8 million tons, are utilized principally as livestock feeds, generally in the local areas of production.

Over 5.6 millions of tons of fresh vegetables, fruits, and nuts were produced from more than 719,000 acres of irrigated lands in 1955, and miscellaneous food crops such as dry beans, sugar beets, mint, hops, etc., totaling over 5.9 million tons were produced from almost 677,000 acres. Data on crop production by crop groups follow:

Crop groups	Irrigated crops		Gross crop value	
	Acres	Percent of total	Total	Percent of total
Cereals	1, 585, 465	25. 3	$98, 554, 656	11. 9
Forage	3, 294, 765	52. 6	169, 856, 696	20. 5
Field crops, miscellaneous	1, 119, 288	17. 9	231, 936, 540	28. 0
Seeds	285, 800	4. 6	28, 485, 153	3. 4
Vegetables	458, 901	7. 3	143, 133, 802	17. 4
Fruits and nuts	260, 463	4. 2	132, 784, 946	16. 0
Other [1]			22, 953, 949	2. 8
Total reported	7, 004, 682	111. 9		
Less residue and multiple crops	888, 631	14. 2		
Plus soil-building crops	145, 710	2. 3		
Net acres irrigated	6, 261, 761	100. 0	827, 705, 742	100. 0

[1] Additional revenues from Federal and commercial agencies.

The volume of agricultural production totaled over 27 million tons in 1955, an increase of almost 458,000 tons over 1954. Increases were noted for all crop groups except miscellaneous field crops, which decreased more than 735,000 tons. The production of cotton was down more than 200,000 bales, sugar beets decreased almost 600,000 tons, and dry beans fell off about 18,000 tons. Average per acre crop yields were slightly higher than in 1954 for the principal crops produced on most Federal irrigation projects, and in all, 1955 was a good crop year.

Average unit prices received by irrigation farmers for their products were generally somewhat lower than in 1954. This was true for all the principal crops except alfalfa hay, lettuce, dry onions, and peaches, which increased slightly in 1955.

The most significant individual crops produced on irrigated project lands in 1955 were barley, wheat, alfalfa hay, pasture, sugar beets, cotton, dry beans, late potatoes, tomatoes, lettuce, carrots, sweet corn, apples, peaches, table grapes, and citrus fruits. The acreage irrigated and gross crop value for each of these crops follow:

Crop	Acres	Gross crop value	
		Per acre	Total
Barley	518, 146	$52. 64	$27, 277, 488
Wheat	406, 402	78. 13	31, 751, 977
Alfalfa hay	1, 549, 665	77. 40	119, 949, 491
Pasture	1, 013, 612	29. 07	29, 465, 392
Sugar beets	326, 285	168. 64	55, 024, 398
Cotton	426, 561	282. 78	120, 623, 944
Beans, dry	324, 364	84. 06	27, 267, 356
Potatoes, late	183, 256	201. 15	36, 862, 363
Tomatoes, fresh	11, 697	1, 012. 01	11, 837, 461
Lettuce	51, 244	504. 67	25, 861, 095
Carrots	10, 070	801. 98	8, 075, 981
Sweet corn	24, 163	159. 89	3, 863, 426
Apples	37, 502	709. 40	26, 604, 003
Peaches	27, 212	419. 29	11, 409, 607
Table grapes	51, 645	506. 76	26, 171, 705
Citrus fruit	43, 834	565. 08	24, 769, 563

The 73 Reclamation irrigation projects, located throughout the 17 Western States, are divided into 7 regions for administrative purposes. States located mainly within each region are as follows:

Region 1—Washington, Oregon, Idaho, and western Montana;
Region 2—California, except southern portion;
Region 3—Arizona, southern California, and southern Nevada;
Region 4—Nevada, Utah, western Colorado, and southwestern Wyoming;
Region 5—Texas, New Mexico, Oklahoma, and southern Kansas;
Region 6—Eastern Montana, North Dakota, South Dakota, and northern Wyoming;
Region 7—Eastern Colorado, Nebraska, northern Kansas, and southeastern Wyoming.

Region 1, with 2,229,614 acres of irrigated lands, the largest in area irrigated of the seven Bureau Regions, produced crops valued at over $242 million. This region contains 36 percent of the irrigated lands and accounted for 29 percent of the total value of crops produced on all Reclamation projects in 1955. Region 3, with less than half as much irrigated land as Region 1, produced crops valued at almost $213 million, or 26 percent of the total production from all Federal projects during this same year. Comparative data for regions follow:

Region	Irrigated acres		Gross crop value	
	Acres	Percent	Total	Percent
1	2, 229, 614	36	$242, 676, 213	29
2	869, 765	14	184, 086, 738	22
3	911, 397	15	212, 984, 713	26
4	543, 421	9	39, 502, 914	5
5	261, 536	4	45, 921, 093	6
6	469, 803	7	20, 013, 649	2
7	976, 225	15	82, 520, 422	10
Total	6, 261, 761	100	827, 705, 742	100

Each of the 17 Western States participated in the Reclamation harvest for 1955. Idaho had a larger acreage of irrigated project lands than any of the other States, followed by California, Colorado, Washington, Oregon, Arizona, Nebraska, Utah, and Montana. The gross value of crops produced on Federal projects located in California was higher than for the other Western States; however, the average gross crop value per acre was highest for Arizona, followed by California, Texas, Washington, New Mexico, Oklahoma, etc., respectively. Irrigated acreage and crop value data are presented for each State as follows:

TABLE 1.—*Projects in operation—Irrigation and crop value data for the calendar year 1955*

State, project and division	Irrigable acreage	Irrigated [1] acreage	Gross crop value	Gross crop value per acre irrigated
Arizona	*Acres*	*Acres*	*Dollars*	*Dollars*
Gila	82, 600	53, 627	7, 448, 713	138. 90
Salt River	332, 553	275, 053	72, 347, 191	263. 03
Yuma	51, 936	45, 539	14, 617, 590	320. 99
Yuma Auxiliary	3, 423	2, 484	683, 248	275. 06
Subtotal	470, 512	376, 703	95, 096, 742	252. 44
California				
Boulder Canyon:				
Coachella division	74, 800	50, 140	26, 650, 603	531. 52
Imperial division	530, 000	474, 557	89, 624, 039	188. 86
Central Valley	852, 204	654, 425	165, 964, 875	253. 60
Klamath	90, 390	78, 021	7, 591, 119	97. 30
Orland	19, 439	16, 661	1, 212, 728	72. 79
Yuma	14, 610	9, 997	1, 613, 329	161. 38
Subtotal	1, 581, 443	1, 283, 801	292, 656, 693	227. 96
Colorado				
Colorado-Big Thompson	615, 000	615, 000	51, 210, 768	83. 27
Fruitgrowers Dam	2, 662	1, 850	309, 181	167. 12
Grand Valley	42, 495	36, 653	5, 106, 614	139. 32
Mancos	8, 746	7, 217	308, 644	42. 77
Missouri River Basin:				
Upper Republican division: St. Francis unit	745	745	47, 762	64. 11
Paonia	11, 500	8, 900	736, 891	82. 80
Pine River	40, 718	34, 878	1, 294, 092	37. 10
Pine River Indian Irrigation District	10, 062	9, 797	349, 615	35. 69
Uncompahgre	88, 601	73, 762	4, 990, 262	67. 65
Subtotal	820, 529	788, 802	64, 353, 829	81. 58

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[1] Includes a minor acreage of Class 6 land irrigated on a temporary annual water rental basis.

TABLE 1.—*Projects in operation—Irrigation and crop value data for the calendar year 1955*—Continued

State, project and division	Irrigable acreage	Irrigated acreage	Gross crop value	Gross crop value per acre irrigated
Idaho	*Acres*	*Acres*	*Dollars*	*Dollars*
Avondale	927	287	18, 925	65. 94
Boise	356, 130	326, 095	31, 186, 619	95. 64
Dalton Gardens	944	484	39, 043	80. 67
Lewiston Orchards	3, 528	2, 198	777, 682	353. 81
Minidoka	1, 095, 802	1, 020, 177	82, 135, 124	80. 51
Owyhee	33, 454	31, 809	3, 127, 168	98. 31
Preston Bench	4, 500	3, 733	300, 671	80. 54
Rathdrum Prairie	4, 236	3, 415	341, 052	99. 87
Subtotal	1, 499, 521	1, 388, 198	117, 926, 284	84. 95
Kansas				
Missouri River Basin:				
Bostwick division: Superior-Courtland unit	9, 785	2, 385	122, 821	51. 50
Montana				
Bitter Root	16, 665	16, 386	551, 643	33. 67
Buffalo Rapids	25, 726	23, 052	1, 263, 640	54. 82
Frenchtown	4, 810	3, 932	214, 679	54. 60
Huntley	33, 152	25, 324	1, 291, 072	50. 98
Intake	881	690	17, 160	24. 87
Lower Yellowstone	37, 395	32, 591	2, 125, 155	65. 21
Milk River	132, 220	78, 261	3, 372, 380	43. 09
Missoula Valley	977	830	31, 033	37. 39
Missouri River Basin:				
Three Forks division: Crow Creek pump unit	1, 542	813	20, 750	25. 52
Yellowstone division: Savage unit	2, 215	2, 022	62, 041	30. 68
Sun River	95, 646	76, 406	2, 387, 297	31. 24
Subtotal	351, 229	260, 307	11, 336, 850	43. 55
Nebraska				
Mirage Flats	11, 657	11, 190	980, 887	87. 66
Missouri River Basin:				
Bostwick division: Superior-Courtland unit	13, 813	10, 434	893, 882	85. 67
Frenchman-Cambridge division	22, 390	15, 528	1, 318, 983	84. 94
North Platte	286, 728	242, 431	22, 039, 980	90. 91
Subtotal	334, 588	279, 583	25, 233, 732	90. 25
Nevada				
Humboldt	37, 446	20, 275	1, 119, 452	55. 21
Newlands	71, 013	53, 472	3, 076, 505	57. 53
Truckee storage	29, 212	22, 697	1, 774, 290	78. 17
Subtotal	137, 671	96, 444	5, 970, 247	61. 90
New Mexico				
Carlsbad	25, 055	20, 000	3, 695, 724	184. 79
Fort Sumner	6, 500	5, 379	464, 416	86. 34
Rio Grande	102, 126	86, 153	19, 635, 324	227. 91
Tucumcari	42, 214	33, 616	1, 869, 467	55. 61
Vermejo	7, 379	3, 763	106, 534	28. 31
Subtotal	183, 274	148, 911	25, 771, 465	173. 07
North Dakota				
Buford-Trenton	10, 510	9, 074	403, 985	44. 52
Lower Yellowstone	19, 405	16, 456	1, 020, 203	62. 00
Missouri River Basin:				
Heart division:				
Dickinson unit	288	288	15, 010	52. 12
Heart Butte unit	70	70	4, 285	61. 21
North Dakota pumping division: Fort Clark unit	2, 056	455	26, 766	58. 83
Subtotal	32, 329	26, 343	1, 470, 249	55. 81
Oklahoma				
W. C. Austin	47, 809	42, 847	4, 717, 599	110. 10
Oregon				
Arnold	4, 248	2, 632	134, 592	51. 14
Baker	7, 312	7, 305	342, 988	46. 95
Boise	1, 724	1, 424	86, 058	60. 43
Burnt River	15, 230	15, 115	736, 934	48. 76
Crescent Lake Dam	6, 831	5, 611	390, 923	69. 67
Deschutes	99, 662	94, 550	10, 078, 899	106. 60
Grants Pass	10, 369	7, 408	946, 280	127. 74
Klamath	127, 159	120, 658	9, 318, 016	77. 23
Ochoco	8, 500	8, 140	605, 470	74. 38
Owyhee	85, 485	80, 517	10, 080, 577	125. 20
Umatilla	32, 769	23, 717	1, 895, 665	79. 93
Vale	32, 000	30, 415	1, 703, 606	56. 01
Subtotal	431, 289	397, 492	36, 320, 008	91. 37

TABLE 1.—*Projects in operation—Irrigation and crop value data for the calendar year 1955*—Continued

State, project and division	Irrigable acreage	Irrigated acreage	Gross crop value	Gross crop value per acre irrigated
South Dakota	*Acres*	*Acres*	*Dollars*	*Dollars*
Belle Fourche	57, 400	54, 537	2, 241, 588	41. 10
Missouri River Basin:				
Cheyenne division:				
Angostura unit	8, 971	8, 084	424, 733	52. 54
Rapid Valley	8, 900	7, 583	189, 378	24. 97
Subtotal	75, 271	70, 204	2, 855, 699	40. 68
Texas				
Balmorhea	10, 608	8, 094	991, 095	122. 45
Rio Grande	94, 220	61, 684	14, 440, 934	234. 11
Subtotal	104, 828	69, 778	15, 432, 029	221. 16
Utah				
Hyrum	6, 800	5, 764	359, 301	62. 34
Moon Lake	75, 256	49, 720	1, 036, 819	20. 85
Newton	2, 200	1, 963	106, 265	54. 13
Ogden River	23, 656	15, 765	1, 714, 788	108. 77
Provo River	46, 609	38, 610	4, 025, 045	104. 25
Sanpete	13, 663	12, 063	496, 168	41. 13
Scofield	15, 609	14, 219	660, 170	46. 43
Strawberry Valley	44, 374	41, 123	2, 800, 798	68. 11
Weber River	109, 032	90, 960	8, 937, 343	98. 26
Subtotal	337, 199	270, 187	20, 136, 697	74. 53
Washington				
Columbia Basin	246, 849	149, 229	16, 960, 981	113. 66
Okanogan	5, 316	3, 983	739, 128	185. 57
Yakima	449, 099	393, 955	79, 551, 144	201. 93
Subtotal	701, 264	547, 167	97, 251, 253	177. 74
Wyoming				
Kendrick	22, 128	12, 857	537, 060	41. 77
North Platte	70, 676	65, 655	5, 368, 279	81. 76
Riverton	62, 283	58, 110	2, 292, 667	39. 45
Shoshone	94, 107	75, 987	2, 855, 539	37. 58
Subtotal	249, 194	212, 609	11, 053, 545	51. 99
Grand total	7, 367, 735	6, 261, 761	827, 705, 742	132. 18

State	Projects or major divisions	Irrigated acreage	Gross crop value	
			Average per acre	Total
	Number	*Acres*	*Dollars*	*Dollars*
Arizona	4	376, 703	252. 44	95, 096, 742
California	6	1, 283, 801	227. 96	292, 656, 693
Colorado	9	788, 802	81. 58	64, 353, 829
Idaho	8	1, 388, 198	84. 95	117, 926, 284
Kansas	1	2, 385	51. 50	122, 821
Montana	11	260, 307	43. 55	11, 336, 850
Nebraska	4	279, 583	90. 25	25, 233, 732
Nevada	3	96, 444	61. 90	5, 970, 247
New Mexico	5	148, 911	173. 07	25, 771, 465
North Dakota	4	26, 343	55. 81	1, 470, 249
Oklahoma	1	42, 847	110. 10	4, 717, 599
Oregon	12	397, 492	91. 37	36, 320, 008
South Dakota	3	70, 204	40. 68	2, 855, 699
Texas	2	69, 778	221. 16	15, 432, 029
Utah	9	270, 187	74. 53	20, 136, 697
Washington	3	547, 167	177. 74	97, 251, 253
Wyoming	4	212, 609	51. 99	11, 053, 545
Total	89	6, 261, 761	132. 18	827, 705, 742

The acreage and value of crops produced on each of the Federal Reclamation projects in calendar year 1955 are shown in table 1, while similar cumulative figures for all projects for the years 1906 to 1955, inclusive, are listed in table 2.

TABLE 2.—*Annual acreage and cumulative crop values—calendar years 1906–55*

Year	Federal irrigation projects[1]					Warren Act lands and special contractors					Entire area				
	Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value		Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value		Irrigable acreage	Irrigated acreage	Net area in cultivation	Total crop value	
				For year	Cumulative total				For year	Cumulative total				For year	Cumulative total
1906	39,300	[2] 22,300	[2] 20,100	[2] $244,900	$244,900	----	----	----	----	----	39,300	[2] 22,300	[2] 20,100	[2] $244,900	$244,900
1907	266,300	[2] 187,628	[2] 169,000	[2] 4,760,460	5,005,360	----	----	----	----	----	266,300	[2] 187,628	[2] 169,000	[2] 4,760,460	5,005,360
1908	488,942	[2] 289,549	[2] 260,500	[2] 7,635,888	12,641,248	----	----	----	----	----	488,942	[2] 289,549	[2] 260,500	[2] 7,635,888	12,641,248
1909	730,601	410,628	410,628	11,920,663	24,561,911	----	----	----	----	----	730,601	410,628	410,628	11,920,663	24,561,911
1910	917,751	473,423	473,423	12,974,639	37,536,550	----	----	----	----	----	917,751	473,423	473,423	12,974,639	37,536,550
1911	1,042,609	564,681	564,681	13,121,224	50,657,774	----	----	----	----	----	1,042,609	564,681	564,681	13,121,224	50,657,774
1912	1,205,236	618,680	641,397	14,479,368	65,137,142	----	----	----	----	----	1,205,236	618,680	641,397	14,479,368	65,137,142
1913	1,255,381	699,183	642,216	15,732,215	80,869,357	----	----	----	----	----	1,255,381	699,183	642,216	15,732,215	80,869,357
1914	1,240,875	761,271	703,424	16,475,517	97,344,874	----	----	----	----	----	1,240,875	761,271	703,424	16,475,517	97,344,874
1915	1,472,772	856,778	757,613	18,164,452	115,509,326	----	----	----	----	----	1,472,772	856,778	757,613	18,164,452	115,509,326
1916	1,405,452	922,821	858,291	32,815,972	148,325,298	----	----	----	----	----	1,405,452	922,821	858,291	32,815,972	148,325,298
1917	1,599,525	1,057,513	966,784	56,462,313	204,787,611	----	----	----	----	----	1,599,525	1,057,513	966,784	56,462,313	204,787,611
1918	1,732,374	1,141,516	1,051,193	66,821,396	271,609,007	951,987	[2] 501,100	[2] 481,600	[2] $35,000,000	$35,000,000	2,684,361	[2] 1,642,616	[2] 1,532,793	[2] 101,821,396	306,609,007
1919	1,636,159	1,187,255	1,113,469	88,974,137	360,583,144	1,011,815	916,313	880,613	64,004,750	99,004,750	2,647,974	2,103,568	1,994,082	152,978,887	459,587,894
1920	1,661,960	1,223,480	1,153,820	66,171,650	426,754,794	1,183,292	981,940	950,890	47,505,770	146,510,520	2,845,252	2,205,420	2,104,710	113,677,420	573,265,314
1921	1,674,100	1,227,500	1,157,900	49,620,300	476,375,094	1,146,810	1,001,250	969,550	44,906,130	191,416,650	2,820,910	2,228,750	2,127,450	94,526,430	667,791,744
1922	1,692,700	1,202,130	1,169,100	50,360,850	526,735,944	1,101,700	983,290	951,270	33,240,840	224,657,490	2,794,400	2,185,420	2,120,370	83,601,690	751,393,434
1923	1,718,490	1,213,700	1,179,870	65,046,300	591,782,244	1,231,400	1,051,380	993,040	37,557,860	262,215,350	2,949,800	2,265,080	2,172,910	102,604,160	853,997,594
1924	1,805,730	1,290,890	1,216,610	66,488,560	658,270,804	1,237,885	930,670	889,460	43,237,470	305,452,820	3,043,615	2,221,560	2,106,070	109,726,030	963,723,624
1925	1,802,970	1,320,300	1,242,750	77,608,880	735,879,684	1,340,000	1,019,170	951,250	53,655,850	359,108,670	3,142,970	2,339,470	2,194,000	131,264,730	1,094,988,354
1926	1,844,550	1,411,020	1,361,470	60,664,900	796,544,584	1,329,020	1,097,190	949,590	49,750,040	408,858,710	3,173,570	2,508,210	2,311,060	110,414,940	1,205,403,294
1927	1,956,910	1,378,990	1,431,560	72,047,200	868,591,784	1,482,950	1,148,115	1,072,486	61,160,010	470,018,720	3,439,860	2,527,105	2,504,046	133,207,210	1,338,610,504
1928	1,882,930	1,442,080	1,489,240	81,077,750	949,669,534	1,490,735	1,235,020	1,192,030	62,495,320	532,514,040	3,373,665	2,677,100	2,681,270	143,573,070	1,482,183,574
1929	1,922,330	1,483,900	1,512,250	88,459,390	1,038,128,924	1,480,040	1,234,230	1,192,990	72,720,490	605,234,530	3,402,370	2,718,130	2,705,240	161,179,880	1,643,363,454
1930	1,993,390	1,504,810	1,550,967	65,007,270	1,103,136,194	1,640,722	1,286,046	1,254,493	54,654,550	659,889,080	3,634,112	2,790,856	2,805,460	119,661,820	1,763,025,274
1931	2,027,264	1,552,718	1,520,354	40,554,037	1,143,690,231	1,588,972	1,293,889	1,251,830	33,406,340	693,295,420	3,616,236	2,846,607	2,772,184	73,960,377	1,836,985,651
1932	2,039,074	1,555,144	1,578,880	31,531,162	1,175,221,393	1,512,405	1,214,461	1,196,400	18,627,219	711,922,639	3,551,479	2,769,605	2,775,280	50,158,381	1,887,144,032
1933	2,025,508	1,589,770	1,598,702	48,765,863	1,223,987,256	1,514,201	1,239,017	1,199,113	35,425,870	747,348,509	3,539,709	2,828,787	2,797,815	84,191,733	1,971,335,765
1934	1,986,268	1,552,124	1,527,104	60,928,969	1,284,916,225	1,508,377	1,285,081	1,229,594	40,014,745	787,363,254	3,494,645	2,837,205	2,756,698	100,943,714	2,072,279,479
1935	2,113,506	1,640,936	1,604,166	63,601,663	1,348,517,888	1,500,589	1,294,680	1,256,970	43,179,631	830,542,885	3,614,095	2,935,616	2,861,136	106,781,294	2,179,060,773
1936	2,166,409	1,702,192	1,629,174	78,902,818	1,427,420,706	1,527,008	1,335,995	1,272,745	57,599,662	888,142,547	3,693,417	3,038,187	2,901,919	136,502,480	2,315,563,253
1937	2,194,830	1,725,463	1,700,960	72,893,649	1,500,314,355	1,571,382	1,389,338	1,333,800	45,764,623	933,907,170	3,766,212	3,114,801	3,034,760	118,658,272	2,434,221,525
1938	2,275,882	1,777,584	1,764,363	67,859,804	1,568,174,159	1,507,051	1,329,115	1,276,332	45,693,656	979,510,826	3,782,933	3,106,699	3,040,695	113,463,460	2,547,684,985
1939	2,492,740	1,922,868	1,903,269	73,769,654	1,641,943,813	1,396,800	1,218,108	1,174,803	40,313,140	1,019,823,966	3,889,540	3,140,976	3,078,072	114,082,794	2,661,767,779
1940	2,780,811	2,152,808	2,138,927	80,098,196	1,722,042,009	1,399,057	1,238,262	1,177,103	37,690,481	1,057,514,447	4,179,868	3,391,070	3,316,030	117,788,677	2,779,556,456
1941	3,547,816	2,199,179	2,178,288	110,399,807	1,832,441,816	1,398,338	1,249,204	1,202,172	49,486,191	1,107,000,638	4,946,154	3,448,383	3,380,460	159,885,998	2,939,442,454
1942	3,487,944	2,688,723	2,615,048	193,783,707	2,026,225,523	1,360,757	1,247,512	1,206,651	78,264,809	1,185,265,447	4,848,701	3,936,235	3,821,699	272,048,516	3,211,490,970
1943	2,957,806	2,422,288	2,398,922	218,064,208	2,244,289,731	1,896,026	1,633,041	1,615,424	170,606,761	1,355,872,208	4,853,832	4,055,329	4,014,346	388,670,969	3,600,161,939
1944	2,970,714	2,468,842	2,475,280	224,683,280	2,468,973,611	1,969,281	1,694,861	1,664,069	186,543,084	1,542,415,292	4,939,995	4,163,703	4,139,349	411,226,364	4,011,388,363

1945	2, 975, 590	2, 416, 961	2, 464, 672	232, 545, 321	2, 701, 518, 332	2, 054, 746	1, 745, 627	1, 731, 060	202, 639, 074	1, 745, 054, 366	5, 030, 336	4, 162, 588	4, 195, 732	435, 184, 395	4, 446, 572, 698
1946	3, 079, 761	2, 513, 687	2, 567, 050	279, 711, 300	2, 981, 229, 632	2, 071, 070	1, 808, 282	1, 829, 531	250, 912, 645	1, 995, 967, 011	5, 150, 831	4, 321, 969	4, 396, 581	530, 623, 945	4, 977, 196, 643
1947	3, 091, 977	2, 629, 727	2, 683, 253	300, 474, 560	3, 281, 704, 192	2, 074, 806	1, 831, 975	1, 871, 099	254, 946, 244	2, 250, 913, 255	5, 166, 783	4, 461, 702	4, 554, 352	555, 420, 804	5, 532, 617, 447
1948	3, 221, 464	2, 664, 619	2, 760, 493	277, 160, 874	3, 558, 865, 066	2, 158, 551	1, 894, 136	1, 939, 241	257, 462, 667	2, 508, 375, 922	5, 380, 015	4, 558, 755	4, 699, 734	534, 623, 541	6, 067, 240, 988
1949	3, 296, 297	2, 792, 108	2, 848, 836	277, 347, 763	3, 836, 212, 829	2, 382, 215	2, 028, 481	2, 067, 338	238, 981, 245	2, 747, 357, 167	5, 678, 512	4, 820, 589	4, 916, 234	516, 329, 008	6, 583, 569, 996
1950	3, 398, 168	2, 857, 533	2, 918, 105	287, 683, 368	4, 123, 896, 197	2, 626, 342	2, 219, 653	2, 271, 358	290, 554, 341	3, 037, 911, 508	6, 024, 510	5, 077, 186	5, 189, 463	578, 237, 709	7, 161, 807, 705
1951	4, 049, 409	3, 596, 094	3, 624, 299	445, 407, 191	4, 569, 303, 388	2, 663, 606	2, 279, 675	2, 317, 714	376, 314, 474	3, 414, 225, 982	6, 713, 015	5, 875, 769	5, 942, 013	821, 721, 665	7, 983, 529, 370
1952	4, 264, 906	3, 643, 544	3, 681, 216	504, 544, 596	5, 073, 847, 984	2, 729, 572	2, 312, 206	2, 345, 138	431, 135, 159	3, 845, 361, 141	6, 994, 478	5, 955, 750	6, 026, 354	935, 679, 755	8, 919, 209, 125
1953	4, 354, 911	3, 728, 218	3, 784, 963	417, 790, 763	5, 491, 638, 747	2, 792, 617	2, 369, 397	2, 407, 453	368, 149, 105	4, 213, 510, 246	7, 147, 528	6, 097, 615	6, 192, 416	785, 939, 868	9, 705, 148, 993
1954	4, 468, 641	3, 704, 189	3, 757, 365	455, 025, 858	5, 946, 664, 605	2, 763, 129	2, 421, 577	2, 437, 766	409, 999, 824	4, 623, 510, 070	7, 231, 770	6, 125, 766	6, 195, 131	865, 025, 682	10, 570, 174, 675
1955	4, 563, 099	3, 805, 778	3, 874, 219	427, 900, 236	6, 374, 564, 841	2, 804, 636	2, 455, 983	2, 489, 734	399, 805, 506	5, 023, 315, 576	7, 367, 735	6, 261, 761	6, 363, 953	827, 705, 742	11, 397, 880, 417

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[1] Includes projects constructed by the United States and those for which supplemental water is furnished from storage works built by the United States.

[2] Estimated.

Land Openings

During fiscal year 1956, the Bureau conducted 4 land openings on 4 Reclamation projects, making 235 farm units embracing 26,898 irrigable acres of new land available for settlement.

The greatest number of the foregoing were on the North-Side Pumping Unit of the Minidoka project in Idaho where 194 units were opened for settlement under the provisions of reclamation and homestead laws. Similarly, 17 farm units were offered for homestead entry on the Kennewick division of the Yakima project in Washington. Fifteen farm units on the Columbia Basin project in Washington were offered for sale under the provisions of the Columbia Basin Project Act, and 9 units on the Wellton-Mohawk division of the Gila project in Arizona were offered for sale under provisions of that project's authorization act. Public response to the announced availability of new farm units under the Bureau's settlement program continued at the high level evidenced since the close of World War II, with an average of nearly 88 qualified applicants for each unit offered.

Since the close of World War II, 52 land openings have been held on 13 Reclamation projects. A total of 2,394 new farm units encompassing approximately 200,000 irrigable acres of public land has thus been made available for selection by qualified applicants.

Both technical and financial assistance has continued to be available to settlers during developmental years through cooperative working relations established by the Bureau with the Farmers' Home Administration, the Agricultural Extension Service, the several State colleges and universities, and other appropriate agencies.

During fiscal year 1957 the availability of additional new farm units is anticipated on the Columbia Basin project in Washington, the Minidoka project in Idaho, and on the Gila and Yuma projects in Arizona. Additional privately owned lands in the Central Valley, Columbia Basin, and Missouri Basin projects will be supplied with irrigation water. A considerable amount of this privately owned land may be available for sale by the owners.

Development Farms

The development farm program which was started in 1947 is a vital part of the settlement program on areas being newly developed for irrigation. These farms are conducted in cooperation with various Department of Agriculture agencies and State agricultural colleges.

The field scale operations demonstrate to the inexperienced irrigation farmers the layout of most practical farm irrigation systems, the best methods of irrigation, the crops best adapted to the area, and most effective cultural practices.

During fiscal year 1956 there were 16 development farms in operation located in the Columbia Basin, Gila, and Missouri River Basin projects. Several new farms are proposed for the latter project.

Repayment and Water Service Contracts

During fiscal year 1956, contracts were executed with a number of districts for the repayment of the cost of new project works. The repayment contract for the Ventura River project, signed 6 days after the President approved authorization of the project, established a new record for promptness in securing repayment contract coverage. The contract is the first to require repayment of municipal water costs with interest during construction. The rate of interest, established by the Secretary of the Treasury, is 2.591 percent.

Execution of the repayment contract for the Santa Maria project on April 6, 1956, cleared the way for initiation of construction as the authorizing legislation required execution of a repayment contract in advance of construction. Construction of the Cachuma project was completed and supply works except for Cachuma Dam were transferred under a special contract to the local water users' organizations for operation and maintenance. Officials of the Corning and Colusa County water districts approved forms of water service contracts—the first to be agreed upon by water users' organizations of the Sacramento Canals unit, Central Valley project.

Rehabilitation and betterment contracts were negotiated for the Salt River, Riverton, Orland, Boise, and Rogue River projects.

Construction was initiated on the Michaud Flats project following the execution of a repayment contract with the Falls irrigation district. Construction was also initiated on two units of the Foster Creek division, Chief Joseph Dam project, following execution of repayment contracts by the Bridgeport Bar and Brewster Flat irrigation districts. Execution of an amendatory contract by the Frenchman-Cambridge irrigation district, Missouri River Basin project, permitted continuation of construction of distribution system works.

Special legislation enacted by the Congress this year authorized execution of a repayment contract with the Yuma Mesa irrigation and drainage district, Gila project. The contract, negotiated pursuant to section 7 of the 1939 Reclamation Project Act, adjusted reimbursable obligations for the Yuma Mesa division, and the repayment contract was executed in May 1956. Legislation was also adopted by the Congress authorizing the execution of a repayment contract with the Tule Lake irrigation district, Klamath project. The draft of repayment contract was accepted by the district board and in July 1956 was approved by the local electorate. Enactment of S. 2202 by the Congress authorized negotiation of a repayment contract providing for final repayment settlement for the Valley division of the Yuma project. Legislation was also adopted authorizing a contract with the Riverside irrigation district, Idaho, and amendment of existing contracts with the city of Rapid City, S. Dak.

Table 3 shows that the total value of repayment contracts on June 30, 1956, amounted to $747,342,204.79. Of this amount, a total of $121,473,956.73 had been repaid and delinquencies were insignificant. In addition, over $100 million will be returned to the Government n water service payments under contracts now in force.

TABLE 3.—*Repayment contracts—matured and unmatured, June 30, 1956*

Project and State	Value of repayment contracts			Construction water-right charges, unmatured	Water-right charges, deferred and unmatured	Rehabilitation and betterment charges, unmatured	Total unmatured	Repayments contracts, matured	Due and unpaid
	Construction	Rehabilitation and betterment	Total						
Arnold, Oreg		$197, 925. 82	$197, 925. 82			$166, 314. 33	$166, 314. 33	$31, 611. 49	$2, 500. 03
Avondale, Idaho	$277, 000. 00		277, 000. 00	$277, 000. 00			277, 000. 00		
W. C. Austin, Okla	3, 262, 188. 49		3, 262, 188. 49	2, 771, 170. 00			2, 771, 170. 00	491, 018. 49	
Baker, Oreg	225, 014. 54		225, 014. 54	92, 314. 94	$20, 193. 25		112, 508. 19	112, 506. 35	
Balmorhea, Tex	255, 600. 00		255, 600. 00	233, 848. 50			233, 848. 50	21, 751. 50	
Belle Fourche, S. Dak	4, 230, 188. 73		4, 230, 188. 73	2, 729, 613. 18			2, 729, 613. 18	1, 500, 575. 55	
Bitter Root, Mont	1, 052, 741. 05		1, 052, 741. 05	681, 214. 48			681, 214. 48	371, 526. 57	
Boise, Idaho-Oreg.:									
Arrowrock division	13, 682, 811. 30		13, 682, 811. 30	2, 373, 126. 82	1, 017, 508. 89		3, 390, 635. 71	10, 292, 175. 59	78, 206. 13
Payette division	9, 439, 254. 55		9, 439, 254. 55	8, 123, 562. 97			8, 123, 562. 97	1, 315, 691. 58	
Anderson Ranch Dam	5, 146, 511. 01		5, 146, 511. 01	4, 526, 464. 62			4, 526, 464. 62	620, 046. 39	19, 570. 67
Boulder Canyon, Ariz.-Calif.:									
All-American Canal system	52, 444, 205. 61		52, 444, 205. 61	51, 860, 770. 73			51, 860, 770. 73	583, 434. 88	
Buffalo Rapids, Mont., District 1	930, 000. 00		930, 000. 00	903, 400. 00			903, 400. 00	26, 600. 00	6, 650. 00
Buffalo Rapids, Mont., District 2	696, 000. 00		696, 000. 00	678, 800. 00			678, 800. 00	17, 200. 00	4, 300. 00
Burnt River, Oreg	599, 735. 00		599, 735. 00	344, 835. 24			344, 835. 24	254, 899. 76	
Cachuma, Calif	5, 800, 000. 00		5, 800, 000. 00	5, 800, 000. 00			5, 800, 000. 00		
Carlsbad, N. Mex	3, 741, 760. 67	25, 000. 00	3, 766, 760. 67	1, 890, 063. 68	64, 070. 00	24, 500. 00	1, 978, 633. 68	1, 788, 126. 99	
Central Valley, Calif	62, 483, 022. 05		62, 483, 022. 05	62, 398, 609. 55			62, 398, 609. 55	84, 412. 50	
Colorado-Big Thompson, Colo	26, 031, 000. 00		26, 031, 000. 00	26, 029, 000. 00			26, 029, 000. 00	2, 000. 00	
Colorado River, Tex	5, 510, 500. 00		5, 510, 500. 00	5, 510, 500. 00			5, 510, 500. 00		
Columbia Basin, Wash	87, 547, 900. 96		87, 547, 900. 96	87, 484, 684. 64			87, 484, 684. 64	63, 216. 32	401. 37
Crescent Lake Dam, Oreg		320, 000. 00	320, 000. 00			320, 000. 00	320, 000. 00		
Dalton Gardens, Idaho	270, 200. 00		270, 200. 00	270, 200. 00			270, 200. 00		
Deschutes, Oreg	12, 689, 221. 44		12, 689, 221. 44	12, 486, 877. 04			12, 486, 877. 04	202, 344. 40	
Eden, Wyo	1, 500, 000. 00		1, 500, 000. 00	1, 500, 000. 00			1, 500, 000. 00		
Fort Sumner, N. Mex	2, 432, 166. 55		2, 432, 166. 55	2, 340, 960. 31			2, 340, 960. 31	91, 206. 24	
Frenchtown, Mont	297, 282. 04		297, 282. 04	235, 791. 63			235, 791. 63	61, 490. 41	
Fruitgrowers Dam, Colo	198, 240. 71		198, 240. 71	143, 371. 61			143, 371. 61	54, 869. 10	
Gila, Ariz	48, 116, 167. 45		48, 116, 167. 45	48, 100, 334. 13			48, 100, 334. 13	15, 833. 32	
Grand Valley, Ariz	3, 129, 154. 21	1, 838, 327. 73	4, 967, 481. 94	1, 708, 375. 55		1, 815, 827. 73	3, 524, 203. 28	1, 443, 278. 66	
Grants Pass, Oreg		950, 000. 00	950, 000. 00			940, 000. 00	940, 000. 00	10, 000. 00	
Humboldt, Nev	1, 211, 244. 68	123, 000. 00	1, 334, 244. 68	745, 858. 94		123, 000. 00	868, 858. 94	465, 385. 74	
Huntley, Mont	1, 839, 545. 68		1, 839, 545. 68	719, 210. 17	91, 478. 47		810, 688. 64	1, 028, 857. 04	
Hyrum, Utah	944, 046. 36		944, 046. 36	670, 042. 00			670, 042. 00	274, 004. 36	
Intake, Mont	46, 900. 00		46, 900. 00	43, 435. 00			43, 435. 00	3, 465. 00	
Kendrick, Wyo	2, 800, 000. 00		2, 800, 000. 00	2, 800, 000. 00			2, 800, 000. 00		
Klamath, Oreg.-Calif	4, 432, 552. 87	40, 200. 26	4, 472, 753. 13	1, 325, 689. 31	184, 377. 40	36, 180. 00	1, 546, 246. 71	2, 926, 506. 42	330. 81
Lewiston Orchards, Idaho	2, 500, 000. 00		2, 500, 000. 00	2, 436, 303. 58			2, 436, 303. 58	63, 696. 42	
Lower Yellowstone, Mont.-N. Dak	4, 084, 366. 39		4, 084, 366. 39	1, 394, 368. 77	309, 165. 54		1, 703, 534. 31	2, 380, 832. 08	45, 037. 39
Mancos, Colo	900, 000. 00		900, 000. 00	870, 000. 00			870, 000. 00	30, 000. 00	

Michaud Flats, Idaho	2, 875, 000. 00		2, 875, 000. 00	2, 875, 000. 00			2, 875, 000. 00		
Middle Rio Grande, N. Mex	16, 533, 000. 00		16, 533, 000. 00	16, 533, 000. 00			16, 533, 000. 00		
Milk River, Mont	7, 764, 044. 89	134, 851. 00	7, 898, 895. 89	6, 436, 710. 87	48, 508. 78	134, 851. 00	6, 620, 070. 65	1, 278, 825. 24	16, 001. 84
Minidoka, Idaho-Wyo	20, 804, 525. 02		20, 804, 525. 02	4, 883, 289. 86	120. 37		4, 883, 410. 23	15, 921, 114. 79	1, 214. 68
Mirage Flats, Neb	846, 300. 00		846, 300. 00	823, 410. 00			823, 410. 00	22, 890. 00	11, 390. 00
Missoula Valley, Mont	45, 000. 00		45, 000. 00	44, 578. 00			44, 578. 00	422. 00	
Missouri River Basin:									
Bostwick division, Nebr.-Kans	6, 605, 000. 00		6, 605, 000. 00	6, 605, 000. 00			6, 605, 000. 00		
Angostura unit, S. Dak	718, 000. 00		718, 000. 00	718, 000. 00			718, 000. 00		
Frenchman-Cambridge Division, Nebr	4, 401, 000. 00		4, 401, 000. 00	4, 401, 000. 00			4, 401, 000. 00		
Fort Clark unit, N. Dak	66, 000. 00		66, 000. 00	66, 000. 00			66, 000. 00		
Kirwin unit, Kans	1, 500, 000. 00		1, 500, 000. 00	1, 500, 000. 00			1, 500, 000. 00		
Savage unit, Mont	143, 750. 00		143, 750. 00	143, 665. 02			143, 665. 02	84. 98	
Sargent unit, Nebr	1, 785, 400. 00		1, 785, 400. 00	1, 785, 400. 00			1, 785, 400. 00		
Hanover-Bluff unit, Wyo	672, 560. 00		672, 560. 00	672, 560. 00			672, 560. 00		
Moon Lake, Utah	1, 592, 267. 76		1, 592, 267. 76	1, 074, 780. 73			1, 074, 780. 73	517, 487. 03	
Newlands, Nev	3, 257, 749. 35		3, 257, 749. 35	427, 865. 36	80, 000. 00		507, 865. 36	2, 749, 883. 99	
Newton, Utah	350, 000. 00		350, 000. 00	280, 000. 00			280, 000. 00	70, 000. 00	
North Platte, Nebr.-Wyo	20, 236, 195. 85	3, 851, 821. 27	24, 088, 017. 12	3, 917, 924. 13	90, 860. 00	3, 760, 973. 64	7, 769, 757. 77	16, 318, 259. 35	1, 705. 57
Ochoco, Oreg		500, 000. 00	500, 000. 00			500, 000. 00	500, 000. 00		
Ogden River, Utah	4, 734, 935. 11		4, 734, 935. 11	3, 471, 401. 85			3, 471, 401. 85	1, 263, 533. 26	
Okanogan, Wash	468, 597. 85	126, 000. 00	594, 597. 85	222, 321. 07		126, 000. 00	348, 321. 07	246, 276. 78	6, 138. 25
Orland, Calif	2, 457, 212. 15	542, 413. 23	2, 999, 625. 38	695, 602. 02	296, 871. 03	451, 364. 58	1, 443, 837. 63	1, 555, 787. 75	11, 722. 22
Owyhee, Oreg.-Idaho	19, 826, 659. 47		19, 826, 659. 47	17, 537, 887. 31			17, 537, 887. 31	2, 288, 772. 16	7, 327. 15
Palisades, Idaho	6, 651, 450. 00		6, 651, 450. 00	6, 651, 450. 00			6, 651, 450. 00		
Palo Verde, Calif	1, 675, 000. 00		1, 675, 000. 00	1, 675, 000. 00			1, 675, 000. 00		
Paonia, Colo	2, 320, 000. 00		2, 320, 000. 00	2, 320, 000. 00			2, 320, 000. 00		
Pine River, Colo	1, 500, 000. 00		1, 500, 000. 00	1, 206, 240. 00			1, 206, 240. 00	293, 760. 00	35, 420. 00
Preston Bench, Idaho	453, 000. 00		453, 000. 00	453, 000. 00			453, 000. 00		
Provo River, Utah	19, 443, 650. 00		19, 443, 650. 00	19, 443, 650. 00			19, 443, 650. 00		
Rapid Valley, S. Dak	1, 100, 000. 00		1, 100, 000. 00	987, 500. 00			987, 500. 00	112, 500. 00	
Rathdrum Prairie, Idaho:									
Hayden Lake unit	118, 409. 19		118, 409. 19	93, 017. 25			93, 017. 25	25, 391. 94	
Post Falls unit	190, 000. 00		190, 000. 00	156, 750. 00			156, 750. 00	33, 250. 00	
Rio Grande, N. Mex.-Tex	10, 144, 123. 26		10, 144, 123. 26	2, 566, 335. 35	334, 777. 23		2, 901, 112. 58	7, 243, 010. 68	
Riverton, Wyo	7, 381, 827. 26		7, 381, 827. 26	6, 754, 797. 67			6, 754, 797. 67	627, 029. 59	22, 344. 20
Rogue River, Oreg		1, 712, 000. 00	1, 712, 000. 00			1, 712, 000. 00	1, 712, 000. 00		
Salt River, Ariz	17, 482, 687. 89	5, 771, 869. 50	23, 254, 557. 39	4, 712, 682. 10		5, 020, 112. 73	9, 732, 794. 83	13, 521, 762. 56	
San Luis Valley, Colo	2, 520, 000. 00		2, 520, 000. 00	2, 520, 000. 00			2, 520, 000. 00		
Sanpete, Utah	373, 375. 94		373, 375. 94	223, 815. 68	2, 375. 00		226, 190. 68	147, 185. 26	
Santa Maria, Calif	13, 969, 000. 00		13, 969, 000. 00	13, 969, 000. 00			13. 969, 000. 00		
Scofield, Utah	247, 000. 00		247. 000. 00	167, 400. 00			167, 400. 00	79, 600. 00	
Shoshone, Wyo.-Mont	6, 827, 609. 52	380, 000. 00	7, 207, 609. 52	4, 184, 190. 51	6, 964. 28	380, 000. 00	4, 571, 154. 79	2, 636, 454. 73	
Strawberry Valley, Utah	3, 349, 423. 92		3, 349, 423. 92	749, 749. 76			749, 749. 76	2, 599, 674. 16	
Sun River, Mont.:									
Fort Shaw division	401, 384. 56	38, 151. 04	439, 535. 60	64, 573. 27		37, 551. 04	102, 124. 31	337, 411. 29	
Greenfields division	9, 555, 084. 41		9, 555, 084. 41	8, 255, 621. 25			8, 255, 621. 25	1, 299, 463. 16	
Truckee Storage, Nev	1, 000, 000. 00		1, 000, 000. 00	674, 660. 42			674, 660. 42	325, 339. 58	
Tucumcari, N. Mex	5, 901, 896. 86		5, 901, 896. 86	5, 871, 326. 30			5, 871, 326. 30	30, 570. 56	
Umatilla, Oreg	1, 141, 982. 46		1, 141, 982. 46	623, 963. 78			623, 963. 78	518, 018. 68	6, 998. 84
Uncompahgre, Colo	6, 874, 017. 36		6, 874, 017. 36	5, 667, 179. 07			5, 667, 179. 07	1, 206, 838. 29	
Vale, Oreg	5. 022. 287. 50		5, 022, 287. 50	4, 515, 429. 26			4. 515, 429. 26	506, 858. 24	

TABLE 3.—*Repayment contracts—matured and unmatured, June 30, 1956*—Continued

Project and State	Value of repayment contracts			Construction water-right charges, unmatured	Water-right charges, deferred and unmatured	Rehabilitation and betterment charges, unmatured	Total unmatured	Repayments contracts, matured	Due and unpayed
	Construction	Rehabilitation and betterment	Total						
Vermejo, N. Mex	$2, 107, 943. 33		$2, 107, 943. 33	$2, 107, 943. 33			$2, 107, 943. 33		
Weber Basin, Utah	57, 694, 000. 00		57, 694, 000. 00	57, 694, 000. 00			57, 694, 000. 00		
Weber River, Utah	2, 685, 871. 83		2, 685, 871. 83	881, 929. 04			881, 929. 04	$1, 803, 942. 79	
Yakima, Wash.:									
Kennewick division	4, 809, 700. 00		4, 809, 700. 00	4, 809, 700. 00			4, 809, 700. 00		
Kittitas division	11, 225, 652. 54		11, 225, 652. 54	8, 997, 762. 78			8, 997, 762. 78	2, 227, 889. 76	
Roza division	19, 228, 100. 00		19, 228, 100. 00	18, 264, 318. 05			18, 264, 318. 05	963, 781. 95	
Storage division	3, 600, 134. 12	$719, 262. 47	4, 319, 396. 59	720, 301. 25		$540, 267. 12	1, 260, 568. 37	3, 058, 828. 22	
Sunnyside division	4, 184, 933. 34		4, 184, 933. 34	243, 360. 74	$45, 779. 67		289, 140. 41	3, 895, 792. 93	
Tieton division	3, 449, 113. 59		3, 449, 113. 59					3, 449, 113. 59	
Yuma, Ariz.-Calif	5, 608, 580. 23		5, 608, 580. 23	358, 591. 64	107, 509. 10		466, 100. 74	5, 142, 479. 49	$249. 74
Yuma Auxiliary, Calif	1, 404, 423. 57		1, 404, 423. 57	878, 314. 77			878, 314. 77	526, 108. 80	424. 69
Grand total	730, 071, 382. 47	17, 270, 822. 32	747, 342, 204. 79	607, 078, 746. 88	2, 700, 559. 01	16, 088, 942. 17	625, 868, 248. 06	121, 473, 956. 73	277, 933. 58

Soil and Moisture Conservation Operations

The Bureau of Reclamation has continued to make progress in its objective to protect the land and facilities under its jurisdiction from wind and water erosion.

This program, which is in keeping with the Department's overall conservation policies, has included structural installations, reseeding, and other means of erosion control and stabilization.

The planning, financing, and performance of the work are accomplished in cooperation with other Federal agencies and State and local agencies, including water-users' organizations.

Weed Control

During fiscal year 1956, the weed-control program conducted by the Bureau on irrigation systems has proved effective in reducing the problems caused by undesirable vegetation and in decreasing operation and maintenance costs. It also has aided materially in reducing water losses resulting from transpiration, evaporation, and seepage due to weed growths.

More efficient and economical methods of controlling weeds infesting banks and channels of irrigation systems have been developed and put into practice through the research programs conducted by the Agricultural Research Service, Department of Agriculture, for and in cooperation with the Bureau of Reclamation. This work has been accomplished at field stations at Phoenix, Ariz.; Prosser, Wash.; Bozeman, Mont.; and Laramie, Wyo., and in Reclamation's weed-control laboratory in Denver.

Under the provisions of the Halogeton Glomeratus Act (P. L. 529, July 14, 1952), the Bureau is cooperating in the control of the poisonous weed Halogeton on Bureau lands in Utah, Nevada, Colorado, Wyoming, Montana, and Idaho.

Flood Control and Recreation

When the Bureau of Reclamation constructs a dam which creates a reservoir for irrigation and power development, this by no means represents the full extent of the benefits to be derived from the project. Storage space in which to confine rampaging floodwaters and facilities for recreation at water playgrounds in the otherwise arid portions of the West, are two additional dividends paid under the Federal water resource conservation partnership.

Bureau reservoirs were able to render extraordinary service in helping to control floods during 1956. In Washington, Idaho, and Oregon, particularly, the runoff of heavy snowmelt on most streams of the Columbia Basin was of flood proportions, and storage in the Bureau of Reclamation reservoirs prevented several local disasters as well as reducing the flood crest of the Columbia River itself.

The peak flow of the Columbia River at The Dalles, Oreg., on June 3 was 814,000 cubic feet per second. Had it not been for upstream storage, this peak would have been 110,000 cubic feet per second higher. Translated into river level, the flood crest would have been 2.7 feet higher were it not for the storage which was largely provided by existing Reclamation reservoirs.

In the Upper Snake River area in Idaho, the operation of Jackson Lake, the principal reservoir of the Minidoka Reclamation project, as a flood-control reservoir reduced the peak flow at Heise, Idaho, nearly one-fourth. In the Boise Valley in Idaho, although the upstream flow was about 23,000 cubic feet per second, the Boise River was held to 7,500 cubic feet per second at Boise by the operation of Anderson Ranch, Arrowrock, and Lucky Peak Reservoirs. Anderson Ranch and Arrowrock are Bureau of Reclamation structures, and Lucky Peak was built by the Corps of Engineers as a flood control structure whose releases are coordinated with those from Anderson Ranch and Arrowrock for irrigation purposes during the summer.

The peak flow of the Payette River at Emmett, Idaho, reached on May 27, was 15,000 cubic feet per second, which was about equal to flood stage. At the same time, Cascade and Deadwood Reservoirs, upstream, were storing at the rate of nearly 12,000 cubic feet per second. Had it not been for this storage, the river, already flowing at flood stage, would have sharply increased its peak crest.

Numerous other reservoirs on the Snake River and its tributaries were filling during the spring runoff and thus contributed to cutting down the crest. These included the American Falls Reservoir in Idaho and the Owyhee Reservoir in Oregon.

The peak flow of the Yakima River at Parker, Wash., was about 19,000 cubic feet per second on May 20. This is 4,000 feet over flood stage. Were it not for water stored in five irrigation reservoirs upstream, the peak flood flow would have reached 37,000 cubic feet per second.

Hungry Horse Reservoir on the South Fork of the Flathead River in Montana curtailed the peak flow of the Flathead at Columbia Falls where it emerges from the mountains by 31,000 cubic feet per second, or nearly one-third. Operation of this single reservoir is estimated to have curtailed the flood crest of the Columbia by more than 6 inches.

In California, flood control regulation of release of water was required in varying degrees at all of the Bureau's 13 reservoirs but one—Cachuma.

An estimated 9,858,000 persons enjoyed the use of recreational facilities on 140 reservoirs on Reclamation projects throughout the 17 Western States in 1956.

Estimates on expenditures at these Reclamation playgrounds vary considerably, but it is conservatively calculated that out-of-town and local visitors spend about $6 per day. This represents an appropriate share of investments in boats, hunting and fishing equipment, etc., traveling expenses, and food and lodging. Applied to the total number of visitors, this estimate indicated an extra dividend each year of approximately $59 million from Reclamation. A folder entitled "Reclamation Recreational Opportunities" issued during the year, contains information concerning the location of these western water playgrounds and describes the facilities available for swimming, fishing, boating, hunting, camping, picnicking, and lodging.

It is the policy of the Bureau to transfer recreational areas at Federal Reclamation reservoirs to other Federal, State, or local agencies for development and administration. Areas of national significance, such as Lake Mead, at Hoover Dam on the Colorado River in Arizona-Nevada, are administered by the National Park Service, areas wholly or substantially in the national forests are transferred to the Forest Service, U. S. Department of Agriculture, and areas of local interest are transferred to State or local government agencies. The Bureau of Reclamation administers recreational facilities on only 40 of the 140 reservoirs.

HYDROELECTRIC POWER DEVELOPMENT

On June 30, 1956, the installed capacity of powerplants constructed and operated by the Bureau of Reclamation, as a part of multipurpose Reclamation projects, totaled 4,974,550 kilowatts, whereas the capacity installed and operated by other agencies for which the Bureau is the marketing agent totaled 596,500 kilowatts.

The installed capacity of hydroelectric powerplants at Bureau of Reclamation multipurpose projects and at projects for which the Bureau is responsible for marketing the power, increased 320,000 kilowatts during fiscal year 1956.

Sale of electric power during the year aggregated 25,181,596,876 kilowatt-hours, with revenues from sales totaling $55,362,617.68 as shown in table 4. This compared to the previous year's sales of 25,031,325,608 kilowatt-hours, and revenues of $51,764,256.48.

TABLE 4.—*Bureau of Reclamation power systems, power sales, and revenues by projects, fiscal year ending June 30, 1956* [1]

Projects	Sales of electric energy, kilowatt-hours	Revenues from sales
Boise project	212, 909, 761	$410, 011. 16
Columbia Basin project [2]	13, 832, 121, 000	12, 668, 441. 35
Minidoka project	153, 571, 616	656, 256. 66
Yakima project [3]	24, 980, 175	172, 064. 59
Hungry Horse project [4]	1, 208, 009, 400	3, 621, 374. 28
Central Valley project	2, 708, 621, 791	9, 862, 210. 89
Boulder Canyon project	2, 662, 983, 968	7, 378, 331. 57
Parker-Davis project	1, 096, 509, 537	4, 519, 415. 81
Yuma project	7, 319, 247	22, 129. 30
Rio Grande project	57, 443, 312	390, 239. 80
Falcon project	73, 855, 500	199, 409. 88
Fort Peck project	447, 044, 143	1, 903, 246. 84
North Platte project	74, 912, 200	494, 232. 86
Missouri River Basin—Western division, including power systems of Riverton, Shoshone, Colorado-Big Thompson, Kendrick projects	1, 094, 173, 931	6, 817, 224. 26
Missouri River Basin, Eastern division	1, 411, 641, 247	5, 024, 700. 79
Eklutna project, Alaska	115, 500, 048	1, 223, 327. 64
Grand total	25, 181, 596, 876	55, 362, 617. 68

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[1] Does not include energy sales and revenues in transactions between Bureau projects.

[2] Totals include 13,190,098,250 kilowatt-hours delivered to Bonneville Power Administration for marketing and $12,347,430 in payments by that agency not including river regulation benefits.

[3] Totals include 24,967,650 kilowatt-hours delivered to Bonneville Power Administration for marketing and $172,000 in payments by that agency.

[4] Totals include 1,205,446,638 kilowatt-hours delivered to Bonneville Power Administration for marketing and $3,610,000 in payments by that agency.

Present Installed Capacity

During the fiscal year ending June 30, 1956, the Bureau of Reclamation operated 35 powerplants with a total nameplate capacity of 4,974,550 kilowatts, an increase of 120,000 kilowatts over fiscal year 1955. In addition, the Bureau marketed the power generated from plants constructed by the Corps of Engineers and the International Boundary and Water Commission, totaling 596,500 kilowatts, which is an increase of 240,000 kilowatts during fiscal year 1956.

The capacity installed during fiscal year is as follows:

		Kilowatts
Bureau of Reclamation:		
Central Valley project (Folsom powerplant)	108, 000	
Yakima project (Chandler powerplant)	12, 000	120, 000
U. S. Corps of Engineers:		
Missouri River Basin project:		
Fort Randall	80, 000	
Garrison	160, 000	240, 000
		320, 000

Additional Capacity Under Construction

At the end of fiscal year 1956, the Bureau of Reclamation had under construction four powerplants, which will have an ultimate installed nameplate capacity of 154,250 kilowatts. They are: Palisades (114,000 kw.) on the Snake River in Idaho; Deer Creek (5,000 kw.) on the

Provo River in Utah; Roza (11,250 kw.) on the Yakima-Roza Canal in Washington; and Glendo (24,000 kw.) on the North Platte River in Wyoming.

The United States Army Corps of Engineers is proceeding with the construction of its plants on the Missouri River Basin project. The ultimate nameplate capacity of the two plants—Gavins Point and Oahe, in South Dakota—under construction by the Corps will respectively be 100,000 and 425,000 kilowatts. The Bureau of Reclamation will be the marketing agent for energy generated from these plants as is the case for other plants constructed by the Corps on the Missouri River Basin project.

Hydroelectric Powerplants

The status of hydroelectric powerplants for which the Bureau of Reclamation has responsibilities is shown in table 5.

TABLE 5.—*U. S. Department of the Interior, Bureau of Reclamation, hydroelectric powerplants*

A. CONSTRUCTED AND OPERATED BY BUREAU OF RECLAMATION

State or territory	Project	Name of plant	Calendar year of initial operation	Nameplate rating	
				Existing (kilowatts)	Ultimate (kilowatts)
1. Alaska	Eklutna	Eklutna	1955	30, 000	30, 000
2. Alaska	do	Little Eklutna [1]	1955	2, 000	2, 000
3. Arizona-Nevada	Boulder Canyon	Hoover [2]	1936	1, 249, 800	1, 354, 300
4. Arizona-Nevada	Parker-Davis	Davis	1951	225, 000	225, 000
5. Arizona-California	do	Parker	1942	120, 000	120, 000
6. California	Central Valley	Folsom	1955	162, 000	162, 000
7. California	do	Keswick	1949	75, 000	75, 000
8. California	do	Nimbus	1955	13, 500	13, 500
9. California	do	Shasta	1944	379, 000	379, 000
10. California	Yuma	Siphon Drop	1926	1, 600	1, 600
11. Colorado	Colorado-Big Thompson	Estes	1950	45, 000	45, 000
12. Colorado	do	Flatiron	1954	71, 500	71, 500
13. Colorado	do	Green Mountain	1943	21, 600	21, 600
14. Colorado	do	Marys Lake	1951	8, 100	8, 100
15. Colorado	do	Pole Hill	1954	33, 250	33, 250
16. Colorado	Grand Valley	Grand Valley [3]	1932	3, 000	3, 000
17. Idaho	Boise	Anderson Ranch	1950	27, 000	40, 500
18. Idaho	do	Black Canyon	1925	8, 000	8, 000
19. Idaho	do	Boise Diversion	1912	1, 500	1, 500
20. Idaho	Minidoka	Minidoka	1909	13, 400	13, 400
21. Montana	Missouri River Basin	Canyon Ferry	1953	50, 000	50, 000
22. Montana	Hungry Horse	Hungry Horse	1952	285, 000	285, 000
23. New Mexico	Rio Grande	Elephant Butte	1940	24, 300	24, 300
24. South Dakota	Missouri River Basin	Angostura	1951	1, 200	1, 200
25. Washington	Columbia Basin	Grand Coulee	1941	1, 974, 000	1, 974, 000
26. Washington	Yakima-Kennewick	Chandler	1956	12, 000	12, 000
27. Wyoming	Kendrick	Alcova	1955	36, 000	36, 000
28. Wyoming	do	Seminoe	1939	32, 400	32, 400
29. Wyoming	Missouri River Basin	Boysen	1952	15, 000	15, 000
30. Wyoming	do	Kortes	1950	36, 000	36, 000
31. Wyoming	North Platte	Guernsey	1927	4, 800	4, 800
32. Wyoming	do	Lingle	1919	1, 400	1, 400
33. Wyoming	Riverton	Pilot Butte	1925	1. 600	1. 600
34. Wyoming	Shoshone	Heart Mountain	1948	5, 000	5, 000
35. Wyoming	do	Shoshone	1922	5, 600	5, 600
Subtotal A				4, 974, 550	5, 092, 550

See footnotes at end of table.

TABLE 5.—*U. S. Department of the Interior, Bureau of Reclamation, hydroelectric powerplants*—Continued

B. CONSTRUCTED AND OPERATED BY OTHERS—POWER MARKETED BY BUREAU OF RECLAMATION

1. Montana	Fort Peck (USCE)	Fort Peck	1943	85, 000	165, 000
2. South Dakota	Missouri River Basin (USCE)	Fort Randall	1954	320, 000	320, 000
3. North Dakota	do	Garrison	1956	160, 000	400, 000
4. Texas	Falcon (IBWC)	Falcon	1954	31, 500	31, 500
Subtotal B				596, 500	916, 500

C. UNDER CONSTRUCTION BY BUREAU OF RECLAMATION

1. Idaho	Palisades	Palisades	1956	0	114, 000
2. Utah	Provo River Basin	Deer Creek	1957	0	5, 000
3. Washington	Yakima-Roza	Roza	1958	0	11, 250
4. Wyoming	Missouri River Basin	Glendo	1958	0	24, 000
Subtotal C				0	154, 250

D. UNDER CONSTRUCTION BY OTHERS—POWER TO BE MARKETED BY BUREAU OF RECLAMATION

1. South Dakota	Missouri River Basin (USCE)	Gavins Point	1956	0	100, 000
2. South Dakota	do	Oahe	1962	0	425, 000
Subtotal D				0	525, 000
Total				5, 571, 050	[4] 9, 135, 700

[1] Acquired from city of Anchorage for operation with Eklutna project, fiscal year 1955.

[2] Powerplant units operated by Southern California Edison Co. and city of Los Angeles Department of Water and Power as agents of the United States.

[3] Leased to Public Service Co. of Colorado for operation.

[4] Includes 2,273,400 kilowatts in 37 additional powerplants authorized for construction by Bureau and 174,000 kilowatts in 2 powerplants authorized by others.

USCE—United States Corps of Engineers.
IBWC—International Boundary and Water Commission.

Transmission Lines

On June 30, 1956, the Bureau of Reclamation's transmission system consisted of 9,371.4 circuit miles of line. During fiscal year 1956, 302.4 circuit miles of transmission lines were completed. These are shown in table 6.

TABLE 6.—*Transmission lines completed during fiscal year 1956*

Project and Line	Voltage (kilovolts)	In-service date	Circuit miles
Missouri River Basin project:			
Fort Thompson to Huron	230	March 1956	59. 1
Huron to Watertown	230	March 1956	70. 9
Jamestown to Fargo	230	(1)	83. 0
Lovell to Yellowtail	115	(1)	45. 9
Gavins Point Tap to Gavins Point powerplant	115	December 1955 [2]	8. 0
Gavins Point to Belden	115	November 1955	32. 5
Fort Peck project:			
O'Fallon Creek tap extensions	69	March 1956	3. 0
Total			302. 4

[1] Completed but not in service June 30, 1956.

[2] Completed but only 1 circuit of 4 miles in service June 30, 1956.

Power Contracts

During fiscal year 1956 there were 120 contracts executed for the delivery of electric power supply. A number of renewals of operating contracts and revisions of existing contracts resulting from changed operating conditions were consummated. Included are:

Number of contracts:
- 18 with private utilities.
- 53 with REA cooperatives.
- 29 with municipalities.
- 5 with other Federal agencies.
- 3 with public power districts.
- 7 with State authorities.
- 1 with irrigation district.
- 4 miscellaneous type contracts.

The Bureau continued its policy of contracting whenever possible with private utilities, public bodies, and cooperatives for wheeling power and energy over existing facilities. The Bureau also entered into several interchange agreements with its customers. Contracts for wheeling Palisades project power to preference customers were executed with Idaho Power Co. and Utah Power and Light Co.

A summary by classification of customers served by Reclamation during fiscal year 1956 is shown in table 7.

TABLE 7.—*Summary by classification of customers for 12 months ending June 30, 1956* [1]

Type of customers	Number of customers	Sales of electric energy	Revenues from sales of electric energy
		Killowatt-hour	
Privately owned utilities	28	3, 133, 834, 649	$10, 779, 798. 73
Municipal utilities	63	1, 069, 405, 778	4, 530, 021. 71
State government utilities	14	3, 027, 255, 244	11, 272, 130. 45
Cooperative utilities (Rural Electrification Administration projects)	125	1, 182, 433, 336	6, 832, 358. 55
Other Federal utilities [2]	6	14, 496, 695, 046	16, 473, 647. 50
Residential and domestic	298	4, 980, 530	29, 816. 48
Rural (other than Rural Electrification Administration projects)	7	155, 420	1, 013. 31
Commercial and industrial	20	91, 983, 921	467, 216. 36
Public authorities	56	1, 245, 874, 395	3, 967, 265. 62
Interdepartmental	47	928, 978, 557	1, 009, 348. 97
Total all customers	664	25, 181, 596, 876	55. 362, 617. 68

[1] Does not include energy sales and revenues in transactions between Bureau projects.

[2] Totals include 14,420,512,538 kilowatt-hours delivered to Bonneville Power Administration for marketing and $16,129,430 in payments by that agency.

The Bureau at the end of fiscal year 1956 had 123 contracts under active negotiation. This included 28 contracts with municipalities, 44 with REA cooperatives, 9 with non-REA cooperatives, 21 with private utilities, 4 with public power districts, 5 with other Federal agencies, 7 with State authorities, 1 with an irrigation district, and 4 miscellaneous type contracts. A number of these are to renew the existing contract or to revise contracts in existence due to changes in operating conditions.

ENGINEERING AND CONSTRUCTION

Through its design and construction accomplishments in developing the water resources of the western United States, the Bureau of Reclamation in fiscal year 1956 made a major contribution to the conservation of the Nation's natural resources.

The dimensions of the year's achievement in construction are indicated by the completion of irrigation facilities to serve 203,000 acres of land and installation of 120,000 kilowatts of hydroelectric generating capacity. Construction was completed on 4 storage dams which have a combined capacity of more than 2 million acre-feet, 507 miles of electrical transmission lines, and 585 miles of canals and related water conveyance facilities.

An investment of about $160 million was added to the Bureau's $2.6 billion investment in western projects through completion of these and other irrigation and power features.

Awarded for the fiscal year period were 496 construction, material, equipment, and supply contracts. The total value of these contracts was about $63 million. Contracts for construction totaled about $57 million of this amount, or about 90 percent. The 220 construction contracts in progress at the end of the year had a total value of $122 million.

Highlights of the year were completion of Tiber, Webster, and Kirwin Dams on the Missouri River Basin project and Crescent Lake Dam on the Crescent Lake Dam project in Oregon; the placing in full service of the 162,000-kilowatt Folsom powerplant in California and the 12,000-kilowatt Chandler power and pumping plant on the Yakima project in Washington; and the beginning of full operation of the Cachuma project in California, following completion of the 6-mile Tecolote Tunnel. In August 1955, the completion of the Eklutna project, first major Bureau project in Alaska, was dedicated.

Of signal interest were the new starts of construction on the Palo Verde Diversion Dam on the Palo Verde diversion project in California-Arizona; the American Falls pumping plant on the Michaud Flats project in Idaho; the 5,000-kilowatt Deer Creek powerplant on the Provo River project, Utah; the 11,250-kilowatt Roza powerplant on the Yakima project, Washington; and the diversion tunnel for the Trinity Dam on the Central Valley project in California, which will be a principal feature in the transbasin diversion of water from the Trinity coastal basin into the Central Valley. On the Santa Maria project in California a contract was awarded for construction of the Vaquero Dam.

Table 8 lists the major construction contracts (more than $1 million each) awarded by the Bureau of Reclamation in fiscal year 1956. Among features for which contracts were awarded were Vaquero Dam and access road on the Santa Maria project in California, Palo Verde diversion dam and levee system on the Palo Verde diversion project in California-Arizona, the diversion tunnel for the Trinity Dam on the Central Valley project in California, 19.5 miles of the Texas Hill Canal and distribution system on the Wellton-Mohawk division of the Gila project in Arizona, and 19 miles of the Sargent Canal on the Sargent unit of the Missouri River Basin project in Nebraska.

Listed in table 9 are the principal features on Bureau of Reclamation projects completed in fiscal year 1956. The table includes 4

TABLE 8.—*Major Bureau of Reclamation contracts awarded in fiscal year 1956*

Feature	Project	Amount of award
Vaquero Dam and access road	Santa Maria	$6, 179, 639
Palo Verde diversion dam	Palo Verde diversion	2, 900, 760
5.7 miles of pipelines and open channel for Shafter-Wasco laterals, Friant-Kern Canal distribution system.	Central Valley	1, 849, 118
19.5 miles of Texas Hill Canal and distribution system, Wellton-Mohawk division.	Gila	1, 554, 847
Trinity Dam diversion tunnel	Central Valley	1, 348, 000
19 miles of Sargent Canal, 2 miles of wasteway, and 34.4 miles of laterals and drains, Sargent unit.	Missouri River Basin	1, 167, 901
14.1 miles of laterals, Ralph's Mill area, Wellton-Mohawk division.	Gila	1, 164, 494
6.2 miles of Putah South Canal	Solano	1, 147, 921
Palo Verde levee system	Palo Verde diversion	1, 012, 097

TABLE 9.—*Principal features completed on Bureau of Reclamation projects in fiscal year 1956*

Feature	Project	State
272 miles laterals, wasteways, and drains	Columbia Basin	Washington.
21 miles pipelines	do	Do.
26 pumping plants	do	Do.
Crescent Lake Dam	Crescent Lake Dam	Oregon.
Chandler power and pumping plant	Yakima	Washington.
Amon pumping plant	do	Do.
12 miles Kennewick main canal	do	Do.
Unit "A" pumping plant	Minidoka	Idaho.
Tecolote Tunnel, 6 miles long	Cachuma	California.
Folsom powerplant	Central Valley	Do.
17 pumping plants for Friant-Kern Canal distribution system.	do	Do.
91 miles pipeline for Friant-Kern Canal distribution system.	do	Do.
8 miles of Corning Canal	do	Do.
64 miles of laterals	Gila	Arizona.
15 miles of laterals, sublaterals, and wasteways	Eden	Wyoming.
Stoddard diversion dam	Weber Basin	Utah.
Alamogordo Dam enlargement	Carlsbad	New Mexico.
Rehabilitation of El Vado Dam	Middle Rio Grande	Do.
102 miles of drain rehabilitation	do	Do.
Rehabilitation of Vermejo diversion dam and Vermejo and Eagle Tail Canals.	Vermejo	Do.
Tiber Dam	Missouri River Basin	Montana.
Webster Dam	do	Kansas.
Kirwin Dam	do	Do.
Milburn Diversion Dam	do	Nebraska.
417 miles 230-kilovolt transmission lines	do	North Dakota, South Dakota, Minnesota.
90 miles 115-kilovolt transmission lines	do	North Dakota, South Dakota, Wyoming.
102 miles of canals, laterals, and drains	do	Nebraska, Kansas.

storage dams, 2 diversion dams, 2 powerplants, 46 pumping plants, rehabilitation and enlargement of 2 storage dams, 507 miles of transmission lines, 585 miles of canals, pipelines, laterals, wasteways, and drains, and 102 miles of rehabilitated drains.

Progress of Construction

On the Columbia Basin project in Washington, construction progressed rapidly on the irrigation system. The system was extended to serve an additional 54,000 acres in fiscal year 1956. Completed were 272 miles of laterals, wasteways, and drains, and 26 pumping plants.

In Idaho, on the Palisades project, good progress was made on placing the earth embankment of the 13-million cubic yard Palisades Dam. The structure for the 114,000-kilowatt Palisades powerplant was completed and the turbines and generators were being installed at year's end.

The Chandler power and pumping plant on the Yakima project in Washington was completed and the plant's two 6,000-kilowatt generators were placed in service. Also on the Yakima project, the Amon pumping plant and a 12-mile section of the Kennewick main canal were completed. Construction of the project's 11,250-kilowatt Roza powerplant was begun during the year and was about 30 percent completed at the end of the year.

Crescent Lake Dam on the Crescent Lake Dam project in Oregon was completed, and Haystack Dam on the Deschutes project, in the same State, was placed under construction. The unit A pumping plant on the Minidoka project in Idaho was essentially completed.

In California, a construction highlight was completion of the 6-mile Tecolote Tunnel on the Cachuma project. The tunnel, one of the most difficult of the Bureau's construction undertakings in recent years because of large inflows of hot water, was placed in service to connect the project's Cachuma Reservoir with the south coast conduit serving the Santa Barbara area, thus augmenting the community's municipal water supply.

On the Central Valley project in California, construction was completed on the Folsom powerplant and the last 2 of the plant's 3 54,000-kilowatt generators were placed in service. Lateral distribution pipelines totaling 91 miles in length on the project's Friant-Kern Canal distribution system were completed for unit 3 of the Delano-Earlimart irrigation district and units 2 and 3 of the Exeter irrigation district. Work was started on the Shafter-Wasco irrigation district distribution system.

A significant construction milestone on the Central Valley project was start of work on the diversion tunnel for the Trinity Dam late in the spring of 1956. The 500-foot high dam, to be placed under construction in fiscal year 1957, will probably be the highest earthfill dam in the world.

On the Solano project in California, concrete placement for the 302-foot high Monticello Dam neared two-thirds of completion at year's end. A 10-mile section of the highway relocation at Monticello Reservoir was completed, and another 5-mile section neared completion at the end of the fiscal year.

A "new start" late in the fiscal year was the beginning of construction under the Palo Verde diversion project for the Palo Verde diversion dam and levee system on the Colorado River between California and Arizona. Work on the Gila project in Arizona included bringing the Texas Hill Canal and distribution system to substantial completion; construction began on the project's Mohawk laterals of the Ralph's Mill area. In Utah, the Stoddard diversion dam and the 10-mile Gateway Canal were completed on the Weber Basin project. Work on Wanship Dam, an earthfill structure, was ahead of schedule; placing of the dam embankment was brought to about 80 percent of completion. The first 17-mile section of the Davis Aqueduct was about two-thirds completed. Work continued on the 4-mile second section and on the 4-mile Weber aqueduct. Enlargement of the Pineview Dam neared the midway point of completion.

On the Provo River project in Utah, work was begun on the 5,000-kilowatt Deer Creek powerplant.

Indicative of the Bureau's efforts to improve existing irrigation facilities were the rehabilitation of the El Vado Dam and 102 miles of drains on the Middle Rio Grande project, and the rehabilitation of the Vermejo diversion dam and Vermejo and Eagle Tail Canals on the Vermejo project, all in New Mexico. On the Carlsbad project in the same State, the enlargement of the earthfill Alamorgordo Dam was completed.

Progress on the Missouri River Basin was highlighted by completion of three major earthfill dams—Tiber in Montana and Webster and Kirwin in Kansas. In Nebraska, the Milburn diversion dam was completed. More than 500 miles of major electrical transmission lines which extend to areas in North and South Dakota, Minnesota, and Wyoming were completed. The high-voltage lines were placed in service to transmit initial power from the Corps of Engineers' Garrison and Fort Randall powerplants on the main stem of the Missouri River, in North and South Dakota, respectively. Work continued on an additional 240 miles of "backbone" transmission lines in the Dakotas.

In Wyoming, rapid construction progress was made on the Glendo Dam and 24,000-kilowatt powerplant. Overall construction was about 65 percent completed in 50 percent of the contract time. In the same

State, six pumping plants for the project's Hanover-Bluff unit were completed, and construction on the Lucerne Canal and pumping plant on the Owl Creek unit was advanced to the point that completion is expected early in the next fiscal year. The earthfill Pactola Dam in South Dakota is also scheduled for completion early in fiscal year 1957.

In other areas of the Missouri River Basin project, construction was begun on the Upper Meeker Canal on the Frenchman-Cambridge division in Nebraska, which will convey water from the completed Trenton Dam. On the Bostwick division, Kansas, the final section of the Franklin Canal and laterals were completed, a 35-mile reach of the Courtland Canal was completed to the Lovewell Reservoir, and the earthfill Lovewell Dam was about 50 percent completed.

The Bureau continued its efforts to prevent accidents and minimize the occupational hazards of construction work by maintaining its safety program during the year. Significant progress was made in the reduction of accidents on construction operations; the accident frequency rate for the fiscal year 1956 was lowered 12 percent below the fiscal year 1955 rate.

Design Activities and Developments

Design work was facilitated by increased efficiency of operations, and by adoption of new techniques. Major economy in certain designs was an accompanying achievement. The average cost of design as related to the overall Bureau construction and rehabilitation program for the 1956 fiscal year was 4.1 percent.

Design work proceeded on the 500-foot-high, 30-million-cubic-yard Trinity Dam. A new source of impervious material for this earthfill structure was investigated which will provide embankment material at a considerable saving in cost over that considered in the preliminary design.

Underwater television equipment was demonstrated as an effective means of surveying certain eroded areas of the spillway bucket at Shasta Dam on the Central Valley project. The television camera carried underwater by a diver to a depth of 38 feet scanned the eroded areas. The images of the areas appeared on monitors mounted on a barge where they were viewed and evaluated by engineers.

Substantial economies in construction of the new Vaquero Dam on the Santa Maria project in California, will be realized by a design modification in which the outlet works were enlarged to function as a service spillway, and a secondary tunnel spillway was selected to serve as an auxiliary or emergency structure.

A design method was developed to start the generators at the Kortes powerplant by remote control from the Seminoe powerplant, features of the Missouri River Basin project and Kendrick project in Wyoming, respectively. At a signal from the Seminoe powerplant a master relay at the unattended Kortes plant operates a control to open the turbine gates and start the generators.

Designs were completed on the Bureau's first microwave radio system. The system, which will operate between Parker Dam and Phoenix, Ariz., will provide 5 telephone channels for voice communication regarding the power system between Hoover, Parker, and Davis powerplants, the Metropolitan Water District, and the city of Phoenix, 19 telemetering channels for dispatching of data on power generation, and a service channel.

The new Wanship and Gateway powerplants on the Weber Basin project were under design as fully outdoor structures, the first such installations to be built on a Reclamation project. In addition to savings in construction made possible by selection of the outdoor type of design, economies will be achieved in switchyard equipment and steel structures by use of "package-type" switchyard equipment for the powerplants.

Utilizing equipment loaned by the U. S. Geological Survey, the Bureau applied for the first time in its geophysical exploration work a new seismic geophysical technique on the Weber Basin project. By detonating explosives in relatively shallow holes, shock waves were "bounced back" from different strata underground. As a result, it was possible to secure data on the thickess and continuity of possible water-bearing strata to depths up to 4,000 feet. The Bureau also utilized for the first time in its geophysical investigations the technique of "air shooting" (seismic exploration using small explosive charges suspended above the ground surface), thus minimizing the hazard of damage from flying rock particles or pebbles.

Foreign Manufacturers

A total of 40 contracts, principally for electrical equipment, was awarded to companies offering equipment manufactured outside the United States. These contracts, which included 20 Italian, 6 Austrian, 3 English, 5 German, 2 Lebanese, and 4 Swiss, totaled $2,166,763. This total value of awards to foreign manufacturers during fiscal year 1956 was an increase of 125 percent over the value of foreign awards during the previous fiscal year. A differential of 6 percent was added to all foreign bids before comparison was made with domestic bids, in accordance with departmental regulations applying to determinations under the "Buy American Act." An additional 6-percent differential was added if the low domestic bidder indicated that equipment or materials would be produced in an area of substantial labor surplus, as determined by the Secretary of Labor.

The Bureau's engineering laboratories continued test and research programs to help solve design and construction problems and to improve the economy and serviceability of Reclamation projects.

A combined retarding, air-entraining, and plasticizing agent for concrete, which had been subject to intensive laboratory and field testing, was used successfully as a retarder to facilitate lining operations at the Tecolote Tunnel on the Cachuma project in California and at a canal on the Gila project in Arizona where high temperatures tended to accelerate setting of the concrete.

A heated precipitation gage developed by design, planning, and research engineers was constructed on the Eklutna project in Alaska. The gage, having a thermostatically controlled heating system, will operate unattended throughout the winter to provide valuable data for forecasting seasonal water yield inflow to Eklutna Lake.

In soils research, methods were developed for rapidly determining soil density and moisture content. Included were radioisotope methods for density determinations, and calcium carbide, alcohol ignition, and alcohol hydrometer methods for moisture determinations.

Radioisotope methods were successfully used at Soap Lake, Washington, in studying the mixing characteristics of the lower level highly saline water with fresh water introduced in the upper level of the lake. In protective coatings research, a zinc-silicate inorganic type of protective coating, particularly notable for its abrasion resistance, was found to be one of the more promising new materials under test in the laboratories.

In weed control research, tests of variously treated concrete slabs submerged in the Pole Hill Canal on the Colorado-Big Thompson project indicated that incorporation of sulphur in the surface of concrete at the time of casting of the slabs is beneficial to inhibiting algae growth.

During the year 106 laboratory reports were issued covering the subjects of research and testing of concrete materials, hydraulic laboratory studies, earth materials investigations, and protective coatings investigations.

The Bureau continued to contribute its technical resources and skills to the solution of problems of other public organizations and of private agencies.

Construction Costs

Construction costs on Reclamation projects increased about 8.5 percent during fiscal year 1956. Although adequate competition was received under most of the construction specifications and supply invitations for which bids were opened, bidding interest in all types of reclamation construction work continued to decrease from the interest shown in fiscal years 1954 and 1955. The average number of bids per construction schedule, amounting to 8.5 in fiscal year 1954, dropped to 7 in fiscal year 1955, and to about 5.4 in fiscal year 1956.

Table 10 shows cost indexes for Bureau of Reclamation construction work based on the combined costs of material and labor supplied by contractors and materials and labor supplied by the Government.

TABLE 10.—*Bureau of Reclamation construction indexes, fiscal year 1956*

[Cost indexes based on January 1940 costs=1.00]

	July 1955	January 1956	June 1956
Dams:			
Earth	2.10	2.14	2.27
Concrete	2.15	2.19	2.32
Pumping plants:			
Building and equipment	2.60	2.70	2.79
Structures and improvements [1]	2.82	2.86	2.94
Equipment	2.35	2.50	2.58
Pumps and prime movers	2.43	2.59	2.70
Accessory electric and miscellaneous equipment	2.23	2.32	2.41
Discharge pipes	2.96	3.20	3.32
Canals and conduits:			
Canals	2.27	2.29	2.44
Conduits (tunnels, free flow, concrete lined)	2.62	2.64	2.74
Laterals and drains	2.86	2.86	3.00
Powerplants, hydro:			
Building and equipment	2.49	2.59	2.69
Structures and improvements [1]	2.78	2.83	2.90
Equipment	2.34	2.49	2.57
Turbines and generators	2.36	2.50	2.58
Accessory electrical equipment	2.28	2.37	2.46
Miscellaneous equipment	2.40	2.52	2.60
Penstocks	2.96	3.20	3.32
Transmission switchyards and substations	2.55	2.61	2.72
Transmission lines (wood pole 115-kv.)	2.06	2.14	2.20
Transmission lines (steel tower 230-kv.)	2.33	2.44	2.52
Permanent general property buildings	2.71	2.82	2.90
Roads and bridges:			
Primary roads	2.33	2.33	2.40
Secondary roads, unsurfaced	2.06	2.06	2.12
Bridges (steel)	2.88	2.96	3.04
Composite index	2.35	2.44	2.55

[1] Indexes for structures and improvements on pumping plants and powerplants are based on a reinforced concrete structure.

TABLE 11.—*Bureau of Reclamation storage dams, June 30, 1956*

State and project	Name of dam	River	Type	Capacity (acre-feet)	Height (feet)	Length (feet)	Volume (cubic yards)	Year
Alaska: Eklutna	Eklutna	Eklutna Creek	Earth dike and concrete buttressed wall weir.	[1] 182,000	26	555	5,000	1955 [2]
Arizona: Salt River	Bartlett	Verde	Concrete multiple arch	180,000	287	1,063	182,000	1939
	Cave Creek	Cave Creek	do	11,000	109	1,648	18,780	(2)
	Horse Mesa	Salt	Concrete arch	245,000	305	803	162,000	1937 [2]
	Mormon Flat	do	do	58,000	224	505	59,900	1938 [2]
	Roosevelt	do	Masonry gravity	1,382,000	280	1,125	355,800	1911
	Stewart Mountain	do	Concrete arch	70,000	207	1,260	120,500	1936 [2]
Arizona-California: Parker-Davis.	Parker [3]	Colorado	do	717,000	320	856	380,000	1938
Arizona-Nevada:								
Boulder Canyon	Hoover	do	Concrete gravity	29,830,000	726	1,244	4,400,000	1936
Parker-Davis	Davis	do	Earth	1,820,000	200	1,600	4,360,000	1950
California:								
Cachuma	Cachuma	Santa Ynez	do	205,000	275	2,975	6,700,000	1953
	Glen Anne	Offstream	do	500	102	240	323,000	1953
	Lauro	do	do	640	110	540	499,000	1952
Central Valley	Folsom [4]	American	Concrete gravity, embankment wings.	1,010,000	340	10,200	9,010,000	1955
	Friant [3]	San Joaquin	Concrete gravity	521,000	319	3,488	2,135,000	1942
	Keswick	Sacramento	do	24,000	159	1,046	197,000	1950
	Martinez	Offstream	Earth		62	1,200	183,000	1947
	Nimbus	American	Concrete gravity	8,800	76	1,093	205,000	1955
	Shasta	Sacramento	Concrete gravity, embankment wing	4,500,000	602	3,460	6,541,000	1945
	Sly Park	Sly Park Creek	Earth	41,000	190	760		1955
	Sly Park dike	Offstream	do		130	600		1955
	Trinity							(5)
Orland	East Park	Little Stony Creek	Concrete gravity	50,900	139	266	15,750	1910
	Stony Gorge	Stony Creek	Concrete slab-and-buttress	[1] 50,100	139	868	43,100	1928
Solano	Monticello	Putah Creek	Concrete arch	1,600,000	295	1,000	273,000	(5)
Colorado:								
Colorado-Big Thompson	Carter Lake	Offstream	do	112,000	214	1,235	2,550,000	1952
	Dixon Canyon	do	do	152,000	240	1,265	2,960,000	1949
	Horsetooth	do	do		155	1,840	1,870,000	1949
	Soldier Canyon	do	do		226	1,438	3,212,000	1949
	Spring Canyon	do	do		220	1,120	2,100,000	1949
	Flatiron	Chimney Hollow Creek	do	760	86	1,725	382,000	1953
	Granby	Colorado	do	540,000	298	861	2,970,000	1950
	Green Mountain	Blue	do	155,000	309	1,150	4,360,000	1943
	Marys Lake dike No. 1	Offstream	do	930	29	820	90,300	1949
	Marys Lake dike No. 2	do	do		35	950		1949
	Olympus [3]	Big Thompson	Earth, concrete overflow section	3,070	70	1,951	312,000	1949

	Rattlesnake	Rattlesnake Creek	Earth	2, 180	130	1, 100	432, 000	1952
	Shadow Mountain [2]	Colorado	do	18, 400	63	3, 077	167, 000	1946
	Willow Creek	Willow Creek	do	10, 600	127	1, 100	392, 000	1953
Fruitgrowers Dam	Fruitgrowers	Alfalfa Run	do	4, 580	55	1, 520	136, 000	1938
Mancos	Jackson Gulch	Offstream	do	10, 000	180	1, 900	1, 710, 000	1949
Pine River	Vallecito	Los Pinos	do	130, 000	162	4, 010	3, 740, 000	1941
San Luis Valley	Platoro	Conejos	do	60, 000	165	1, 538	912, 000	1951
Uncompahgre	Taylor Park	Taylor	do	[1] 106, 000	206	675	1, 115, 000	1931
Idaho-Oregon:								
Boise	Anderson Ranch	Boise, South Fork	Earth	493, 000	456	1, 400	9, 650, 000	1950
	Arrowrock	Boise	Concrete gravity	287, 000	350	1, 150	636, 000	1915
	Cascade	Payette, North Fork	Earth	704, 000	107	785	395, 000	1948
	Deadwood	Deadwood	Concrete arch	162, 000	165	749	56, 400	1931
	Deer Flat, upper	Offstream	Earth	190, 000	74	4, 000	1, 250, 000	1908
	Deer Flat, lower	do	do		46	7, 200	1, 240, 000	1908
Idaho-Wyoming:								
Minidoka	American Falls	Snake	Concrete, gravity, embankment, wings.	[1] 1,700,000	94	5, 227	314, 000	1927
	Grassy Lake	Grassy Creek	Earth and rock	15, 400	118	1, 170	539, 000	1939
	Island Park	Snake, Henry's Fork	do	128, 000	91	9, 448	564, 000	1938
	Jackson Lake	Snake	Concrete gravity, embankment wings.	[1] 847, 000	78	4, 920	492, 000	1911
	Minidoka [3]	do	Earth and rock, concrete powerhouse section.	210, 000	86	4, 475	257, 000	1906
Palisades	Palisades	Snake, South Fork	Earth	1, 400, 000	260	2, 100	13, 600, 000	([5])
Kansas:								
Bostwick division (Missouri River Basin).	Lovewell	White Rock Creek	do	94, 000	93	8, 500	3, 190, 000	([5])
Smoky Hill division (Missouri River Basin).	Cedar Bluff	Smoky Hill	do	377, 000	199	12, 560	8, 490, 000	1952
Solomon division (Missouri River Basin).	Kirwin	Solomon, North Fork	do	315, 000	169	12, 646	9, 710, 000	1955
	Webster	Solomon, South Fork	do	272, 000	108	10, 600	5, 500, 000	1956
Kansas-Colorado:								
St. Francis unit (Missouri River Basin).	Bonny	Republican, South Fork	do	170, 000	158	9, 200	9, 031, 000	1951
Montana:								
Bitter Root	Como	Rock Creek	do	36, 600	65	2, 550	1, 110, 000	1910
Helena-Great Falls division (Missouri River Basin).	Canyon Ferry	Missouri River	Concrete gravity	2, 050, 000	225	1, 000	414, 400	1954
Hungry Horse	Hungry Horse	Flathead, South Fork		3, 470, 000	564	2, 115	3, 054, 000	1953
Huntley	Anita	Offstream	Earth	400	42	1, 050	143, 000	1937
Lower Marias division (Missouri River Basin).	Tiber	Marias	do	1, 340, 000	205	4, 300	10, 000, 000	1956
	Tiber Dike	do	do		60	17, 000	2, 000, 000	1956
Milk River	Fresno	Milk	do	129, 000	111	2, 070	2, 110, 000	1939
	Nelson	Offstream	do	85, 500	28	9, 900	233, 000	1915
	Sherburne Lake	Swiftcurrent Creek	do	66, 100	96	1, 086	228, 000	1921
Sun River	Gibson	Sun, North Fork	Concrete arch	105, 000	199	960	167, 500	1929
	Pishkun dikes	Offstream	Earth	46, 300	50	9, 050	599, 000	1921
	Willow Creek	Willow Creek	do	32, 400	93	650	275, 000	1911

See footnotes at end of table.

TABLE 11.—*Bureau of Reclamation storage dams, June 30, 1956*—Continued

State and project	Name of dam	River	Type	Capacity (acre-feet)	Height (feet)	Length (feet)	Volume (cubic yards)	Year
Nebraska:								
Frenchman-Cambridge division (Missouri River Basin).	Enders	Frenchman Creek	Earth	74,500	134	2,603	1,950,000	1950
	Medicine Creek	Medicine Creek	do	90,900	165	5,665	2,730,000	1949
	Trenton	Republican	do	254,000	145	7,800	8,130,000	1954
Mirage Flats	Box Butte	Niobrara	do	31,100	87	5,508	1,420,000	1946
Nebraska-Wyoming:								
North Platte	Guernsey	North Platte	do	44,800	135	560	586,000	1927
	Lake Alice, upper	Offstream	do	11,200	30	3,100	241,000	1912
	Lake Alice, lower	do	do		23	2,550	119,000	1913
	Minatare	do	Earth and gravel, concrete-faced	62,200	63	3,700	696,000	1915
	Pathfinder	North Platte	Masonry arch	1,016,000	214	432	65,700	1909
	Pathfinder	do	Earth		38	1,650	152,000	1909
Nevada: Humboldt	Rye Patch	Humboldt	do	[1] 179,000	75	914	356,000	1936
Nevada-California:								
Newlands	Lahontan	Carson	Earth and gravel	[1] 291,000	162	5,400	733,000	1915
	Lake Tahoe [3]	Truckee	Concrete slab-and-buttress, lake outlet regulator.	[1] 732,000	16	109	425	1913
Truckee Storage	Boca	Little Truckee	Earth	41,100	116	1,629	912,000	1939
New Mexico:								
Carlsbad	Alamogordo	Pecos	Earth	122,000	164	3,084	2,250,000	1937
	Avalon [3]	do	Earth and rock, concrete core wall	6,000	58	1,025	202,000	1907
	McMillan	do	Earth	32,300	57	2,114	234,000	1908 [2]
Middle Rio Grande	El Vado	Rio Chama	Earth, steel-faced	195,000	175	1,300	608,000	1955 [2]
Vermejo	Dam No. 2	Offstream	Earth	2,880	12	10,730	206,000	1954
	Dam No. 13	do	do	4,950	32	8,237	248,000	1954
	Stubblefield	do	do	16,160	47	15,700	827,000	1954
New Mexico-Texas:								
Rio Grande	Caballo [3]	Rio Grande	do	341,000	112	4,558	1,240,000	1938
	Elephant Butte	do	Concrete gravity	2,190,000	301	1,674	629,500	1916
	Picacho North	Picacho Arroyo, North Branch.	Earth	[6] 790	45	1,600	149,000	1953
	Picacho South	Picacho Arroyo, South Branch.	do	[6] 460	29	1,680	86,000	1954
North Dakota:								
Heart division (Missouri River Basin)	Dickinson	Heart River	do	16,500	69	2,275	324,000	1950
	Heart Butte	do	do	226,000	174	1,850	1,140,000	1949
Missouri-Souris Division (Missouri River Basin).	Jamestown	James	do	230,000	110	1,418	963,000	1953
Oklahoma: W. C. Austin	Altus [3]	Red, North Fork	Concrete gravity, masonry-faced	164,000	110	1,112	70,200	1945

Oregon:								
Baker	Thief Valley	Powder	Concrete slab-and-buttress	17,600	70	390	6,290	1932
Burnt River	Unity	Burnt	Earth and rock	25,800	83	694	254,000	1938
Crescent Lake	Crescent Lake	Crescent Lake	Earth	86,000	40	450	19,000	1956
Deschutes	Crane Prairie	Deschutes	do	55,300	36	285	29,700	1940
	Haystack	Offstream	do	6,600	105	1,200	535,000	(5)
	Wickiup	Deschutes	do	187,000	100	13,860	1,850,000	1949
Ochoco	Ochoco	Ochoco Creek	do	47,500	125	1,350	750,000	1950[2]
Rogue River Basin	Four Mile Lake	Four Mile Lake	Rock, concrete facing					1956[6]
	Fish Lake	Fish Lake	Earth and rock					1956[6]
Umatilla	Cold Springs	Offstream	Earth	[1] 50,000	117	3,450	793,000	1908
	McKay	McKay Creek	Gravel, concrete-faced	[1] 73,800	180	2,700	2,360,000	1927
Vale	Agency Valley	Malheur, North Fork	Earth	60,000	110	1,850	646,000	1935
	Warm Springs	Malheur, Middle Fork	Concrete arch	192,000	106	469	19,500	1919[7]
Oregon-California:								
Klamath	Clear Lake	Lost	Earth and rock	527,000	39	840	63,400	1910
	Gerber	Miller Creek	Concrete arch	[1] 94,300	88	485	11,900	1925
Oregon-Idaho: Owyhee	Owyhee[3]	Owyhee	Concrete gravity	1,120,000	417	833	537,500	1932
South Dakota:								
Belle Fourche	Belle Fourche	Owl Creek	Earth, concrete-faced	192,000	122	6,262	1,780,000	1911
Cheyenne Division	Angostura	Cheyenne	Concrete gravity, embankment wing.	160,000	189	2,030	750,000	1949
(Missouri River Basin).	Pactola	Rapid Creek	Earth	99,000	230	1,340	4,225,000	1956
Grand Division (Missouri River Basin).	Shadehill	Grand	do	358,000	145	12,843	3,500,000	1951
Rapid Valley	Deerfield	Castle Creek	do	15,700	133	825	607,000	1946
Texas: Colorado River	Marshall Ford	Colorado (Texas)	Concrete gravity, embankment wings.	1,954,000	278	5,093	3,390,000	1942
Utah:								
Hyrum	Hyrum[3]	Little Bear	Earth	18,800	116	540	430,000	1935
Moon Lake	Midview	Offstream	do	[1] 5,800	54	663	139,000	1937
	Moon Lake	Lake Fork, West Fork	do	49,500	101	1,108	513,000	1938
Newton	Newton	Clarkson Creek	do	5,600	101	3,340	410,000	1946
Ogden River	Pine View	Ogden	do	110,000	132	600	418,000	1937
Provo River	Deer Creek	Provo	do	153,000	235	1,304	2,830,000	1941
Scofield	Scofield	Price	do	73,600	125	575	203,000	1945
Strawberry Valley	Strawberry	Strawberry	Earth, concrete core wall	283,000	72	490	118,000	1913
	Indian Creek Dike	do	do		37	1,311	114,000	1913
Weber Basin	Wanship	Weber	Earth	60,000	156	2,010	3,020,000	(5)
	Weber Aqueduct Equalizing.	Offstream	do		40	500	60,000	(5)
Weber River	Echo	Weber	do	[1] 73,900	158	1,887	1,540,000	1931
Washington:								
Columbia Basin	Dry Falls	Offstream	Earth	1,275,000	123	9,880	1,660,000	1949
	North	do	do		145	1,400	1,470,000	1951
	Grand Coulee	Columbia	Concrete gravity	9,402,000	550	4,173	10,590,000	1942
	Long Lake	Offstream	Earth	65,000	163	1,900	1,460,000	1948
	North Scooteney Dike	do	do		16	3,700	62,200	1952
	O'Sullivan	Lower Crab Creek	do	[8] 616,000	225	19,000	8,770,000	1949
	Soda Lake Dike	Soda Lake	do		61	1,750	216,000	1952

See footnotes at end of table.

TABLE 11.—*Bureau of Reclamation storage dams, June 30, 1956*—Continued

State and project	Name of dam	River	Type	Capacity (acre-feet)	Height (feet)	Length (feet)	Volume (cubic yards)	Year
Washington—Continued								
Okanogan	Conconully	Salmon Creek	Earth	[1] 13,000	70	1,000	359,000	1910
	Salmon Lake	do	do	[1] 10,500	42	1,260	195,000	1921
Yakima	Bumping Lake [3]	Bumping	do	33,700	45	3,660	253,000	1910
	Clear Creek [3]	Tieton, North Fork	Concrete arch	5,300	80	404	5,800	1914
	Cle Elum	Cle Elum	Earth	437,000	160	1,801	1,410,000	1933
	Kachess	Kachess	Earth and gravel	[1] 239,000	114	1,400	200,000	1912
	Keechelus	Yakima	do	[1] 158,000	103	6,550	684,000	1917
	Tieton	Tieton	Earth, concrete core wall	198,000	235	920	2,050,000	1925
Wyoming:								
Boysen division (Missouri River Basin).	Boysen	Big Horn	Earth	970,000	220	1,143	1,530,000	1952
Cheyenne division (Missouri River Basin).	Keyhole	Belle Fourche	do	200,000	168	3,420	1,340,000	1952
Eden	Big Sandy	Big Sandy Creek	do	39,700	85	2,400	840,000	1952
Kendrick	Alcova [3]	North Platte	do	190,500	265	763	1,640,000	1936
	Seminoe	do	Concrete arch	1,012,000	295	530	210,000	1939
Oregon Trail division (Missouri River Basin)	Glendo	do	Earth	800,000	207	2,200	3,020,000	(5)
	Kortes	do	Concrete gravity	4,740	244	440	147,000	1951
Riverton	Bull Lake	Bull Lake Creek	Earth	152,000	81	3,456	820,000	1938
	Pilot Butte	Offstream	do	37,000	51	1,300	135,000	1926
Wyoming-Montana:								
Shoshone	Buffalo Bill	Shoshone	Concrete arch	440,000	325	200	82,900	1910
	Deaver	Offstream	Earth	680	14	1,300	30,300	1918
	Ralston	do	do	1,500	35	2,200	24,700	1908

[1] Live storage—dead storage not evaluated.

[2] Non-Reclamation construction. Date is of supplemental construction by Bureau of Reclamation.

[3] Storage and diversion.

[4] Dam constructed by U. S. Army Corps of Engineers, reservoir operated by Bureau of Reclamation.

[5] Under construction.

[6] For flood retention only.

[7] Non-Reclamation construction. Bureau purchased half-interest in 1926.

[8] Greater part of active storage behind O'Sullivan provided through wasteways from primary irrigation features of project.

DEFINITIONS

Capacity: Total reservoir storage to highest controlled water surface, except where indicated by footnote.[1]

Height: Distance between lowest point in foundation and normal crest of dam.

Length: Extent of barrier in dam and integral features constructed between natural abutments.

Volume: Space occupied by all material in dam and its appurtenant features.

Year: Date original construction was completed by Bureau of Reclamation, except as indicated in footnote [2].

TABLE 11A.—*Bureau of Reclamation diversion dams, June 30, 1956*

State and project	Name of Dam	River	Type	Capacity (second-feet)	Height (feet)	Length (feet)	Volume (cubic yards)	Year
Arizona:								
Salt River	Granite Reef	Salt	Concrete weir, embankment wings	3,600	18	1,128	35,000	1908
	Joint Head	do	Concrete weir, embankment wing	200	4	2,600	5,400	1914
	Power Canal	do	do	220	8	862	16,000	1906
Arizona-California:								
Gila and Boulder Canyon, All-American Canal system.	Imperial	Colorado	Concrete slab-and-buttress, overflow section.	17,155	23	3,475	196,800	1938
Palo Verde	Palo Verde	do	Earth, concrete gate structure	1,800	15	1,300	215,000	(1)
Yuma	Laguna	do	Rockfill weir, concrete-surfaced	1,950	10	4,780	487,000	1909
California:								
Central Valley	Camp Creek	Camp Creek	Concrete weir	500	20	119	3,000	1953
Orland	North	Stony Creek	Concrete weir, removable crest	125	3	375	650	1954
	Rainbow	do	Concrete arch, overflow	200	29	155	1,780	1914
	South	do	Concrete weir	225	3	895	3,600	1916
Colorado:								
Colorado-Big Thompson	East Portal	Wind	Rock, concrete core wall	550	10	245		1947
	Horsetooth Supply	Big Thompson	Concrete box	600	8	90	1,300	1950
	Little Hell Creek	Little Hell Creek	Earth and rock	550	33	220	10,000	1952
	North Poudre supply canal.	Cache la Poudre	Concrete weir, embankment wing	250	6	200	1,262	1952
	Pole Hill Afterbay	Little Hell Creek	Earth and rock	550	21	220	6,000	1953
	South Platte supply canal.	Boulder Creek	Concrete weir	230	5	64		1956 [2]
	Willow Creek pump forebay.	Offstream	Earth and rock		11	580	15,000	1953
Fruitgrowers Dam	Dry Creek	Dry Creek	Concrete weir	100	5	36	242	1940
Grand Valley	Grand Valley	Colorado	do	1,675	14	546	25,700	1916
Paonia	Fire Mountain Canal	Gunnison, North Fork	Timber sheet piling, rockfill	180		187		1950
Uncompahgre	East Canal	Uncompahgre	Concrete weir, embankment wing	330	8	764	1,009	1915
	Garnet	do	Rockfill weir, concrete-surfaced	50	4	75	500	1918 [2]
	Gunnison	Gunnison	Timber-crib weir, concrete wings, removable crest.	1,000	10	244	3,200	1912
	Ironstone	Uncompahgre	Concrete gate structure, timber-crib wing.	350	8	[3] 31	155	1915 [2]
	Loutsenhizer	do	Timber weir	290	9	114	400	1911 [2]
	Montrose and Delta	do	Concrete gate structure, movable crest.	500	12	68	500	1915 [2]
	Selig	do	Timber weir, removable crest	300	10	96	500	1914 [2]
Idaho:								
Lewiston Orchards	Sweetwater	Sweetwater Creek	Rockfill weir, concrete diaphragm	77	8	80	400	1948
	Webb Creek	Webb Creek	do	20	10	75	600	1948

See footnotes at end of table.

TABLE 11A.—*Bureau of Reclamation diversion dams, June 30, 1956*—Continued

State and project	Name of Dam	River	Type	Capacity (second-feet)	Height (feet)	Length (feet)	Volume (cubic yards)	Year
Idaho-Oregon:								
Boise	Black Canyon [4]	Payette	Concrete gravity, overflow	1,360	111	1,039	81,200	1925
	Boise River	Boise	Concrete and masonry weir, removable crest.	2,815	39	500	26,100	1908
Idaho-Wyoming:								
Minidoka	Cascade Creek	Cascade Creek	Timber-crib weir	220	6	217	3,070	1937
	Cross Cut	Snake- Henry's Fork	Concrete weir	591	10	457	7,375	1938
Montana:								
Bitter Root	Rock Creek	Rock Creek	Timber sheet piling, concrete weir cap.	350		80		1950
Frenchtown	Frenchtown	Missoula	Earth and rock	172	13	489	12,200	1936
Huntley	Yellowstone River	Yellowstone	Concrete weir	400	8	250	1,674	1934
Milk River	Dodson	Milk	Timber-crib weir, movable crest, embankment wings.	700	23	8,154	87,400	1910
	Saint Mary	Saint Mary	Concrete weir	850	6	198	1,230	1915
	Swift Current	Swift Current Creek	Earth, timber-crib core		13	4,800	98,400	1915
	Vandalia	Milk	Concrete slab-and-buttress weir, movable crest, embankment wing.	300	27	2,350	15,210	1917
Sun River	Sun River	Sun, North Fork	Concrete arch, overflow	1,400	114	261	6,470	1915
Montana-North Dakota: Lower Yellowstone.	Lower Yellowstone	Yellowstone	Timber-crib weir, embankment wing.	840	4	700	22,500	1910
Nebraska:								
Bostwick division (Missouri River Basin).	Superior-Courtland	Republican	Concrete weir, embankment wings	890	21	4,000	179,000	1950
Frenchman-Cambridge (Missouri River Basin)	Bartley	do	do	130	35	3,100	58,000	1954
	Cambridge	do	Concrete weir, embankment wing	325	33	4,650	13,850	1948
Middle Loup division (Missouri River Basin).	Milburn	Middle Loup	Concrete gate structure, embankment wings.	260	12	3,600	70,000	1956
Mirage Flats	Dunlap	Niobrara	Concrete weir, embankment wing	220	6	577	6,360	1945
Nebraska-Wyoming:								
North Platte	Dry Spotted Tail Creek	Dry Spotted Tail Creek	Steel sheet pile and earth		13	255	650	1954
	Horse Creek	Horse Creek	Concrete weir, embankment wing	430	6	720	5,260	1923
	Tub Springs Creek	Tub Springs Creek	Steel sheet pile and earth		9	205		1954
	Whalen	North Platte	Concrete weir, embankment wing	3,700	11	2,460	81,700	1909
Nevada-California:								
Newlands	Carson River	Carson	Concrete gate structure	1,950	14	241	2,707	1905
	Derby	Truckee	Concrete gate structure, embankment wing.	1,500	15	1,331	36,570	1905
New Mexico:								
Fort Sumner	Fort Sumner	Pecos	Concrete weir	100	11	715	27,260	1951
Middle Rio Grande	Angostura	Rio Grande	Concrete, wall weir		27	800		(2)
	Isleta	do	Concrete gate structure	1,051	5	674	2,820	1955 [2]
	San Acacia	do	do		47	700		(2)
Vermejo	Vermejo	Vermejo	Concrete weir, embankment wing	600	5	1,021	4,430	1955 [2]
New Mexico-Texas:								
			Concrete weir, embankment wings	700	7	2,865	22,500	1907

	Percha Arroyo	Percha Arroyo	Earth	30,000	19	2,489	193,000	1939
	Riverside	Rio Grande	Concrete weir, movable crest	1,000	8	283	145,200	1928
Oregon:								
Deschutes	North Canal	Deschutes	Concrete arch-gravity, overflow	1,000	28	293	4,900	(2)
Grants Pass	Savage Rapids	Rogue	Concrete gravity and multiple arch	207	30	456	5,600	1955 [2]
Umatilla	Feed Canal	Umatilla	Concrete, rock, and timber weir, embankment wing.	350	4	2,100	14,100	1907
	Maxwell	do	Concrete and timber-crib weir, embankment wing.	140	5	400	465	1912
	Three Mile Falls	do	Concrete multiple arch, overflow	360	23	915	5,070	1914
Vale	Harper	Malheur	Concrete gate structure, embankment wing.	662	12	914	9,260	1929
Oregon-California:								
Klamath	Lost River	Lost	Concrete multiple arch, overflow, embankment wings.	3,000	26	675	19,920	1912
	Lower Lost River	do	Concrete slab-and-buttress	810	12	324	690	1921
	Malone	do	Concrete gate structure, embankment wing.	220	18	515	21,200	1923
	Miller	Miller Creek	Concrete weir, removable crest, embankment wings.	190	5	290	1,620	1924
South Dakota: Belle Fourche	Belle Fourche	Belle Fourche	Concrete weir, embankment wings	1,635	18	2,523	35,700	1907
Utah:								
Moon Lake	Duchesne Feeder Canal	Duchesne	Concrete weir, embankment wings	200	6	[3] 220	4,000	1939
Provo River	Broadhead	Broadhead Creek	Concrete weir, embankment wing	----	----	40	710	1953
	Duchesne	Duchesne, North Fork	Rockfill weir, concrete core wall	600	----	480	----	1952
	Murdock	Provo	Concrete weir, embankment wing	550	10	100	9,040	1950
	Weber River	Weber	Concrete weir, embankment wings	1,000	10	1,795	15,400	1930
Strawberry Valley	Indian Creek Crossing	Indian Creek	do	750	9	1,350	15,200	1913
	Spanish Fork	Spanish Fork	Concrete weir	500	13	74	1,020	1908
Weber Basin	Slaterville	Weber	Concrete gate structure	1,660	8	162	1,900	(1)
	Stoddard	do	do	715	8	110	----	1956
Washington:								
Okanogan	Salmon Creek	Salmon Creek	Concrete weir, embankment wing	300	5	140	800	1906
Yakima	Easton [4]	Yakima	Concrete gravity, overflow, movable crest.	1,320	43	248	5,760	1929
	Prosser	do	Concrete weir	1,500	7	741	2,470	1956 [2]
	Roza	do	Concrete weir, movable crest	2,200	34	486	21,710	1939
	Sunnyside	do	Concrete weir, embankment wing	1,320	6	[3] 500	1,810	1907
	Tieton	Tieton	do	320	2	510	1,370	1908
Wyoming: Riverton	Wind River	Wind River	do	2,200	19	2,464	124,000	1923
Wyoming-Montana:								
Shoshone	Corbett	Shoshone	Concrete slab-and-buttress weir, embankment wing.	1,000	12	938	10,200	1908
	Willwood	do	Concrete gravity, overflow, embankment wing.	320	41	476	22,120	1924

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[1] Under construction.

[2] Non-Reclamation construction. Date is of supplemental construction by Bureau of Reclamation.

[3] Weir length only.

[4] Diversion and storage.

DEFINITIONS

Capacity: Amount of diversion provided by canal headworks at dam.

Height: Distance between original streambed and highest controlled water surface.

Length: Extent of barrier in dam and integral features constructed between natural abutments, except as indicated in footnote (3).

Volume: Space occupied by all material in dam and its appurtenant features.

Year: Date original construction was completed by Bureau of Reclamation, except as indicated in footnote (2).

Inspection

During the fiscal year major facilities on 34 projects and minor facilities on 21 projects were inspected to assure that equipment and structures were in safe operating condition and were properly maintained.

Facilities on 9 projects were transferred from operation and maintenance by the Bureau to similar responsibility by the water users. Facilities for an additional 18 projects were cleared for such transfer. A total of 22 contracts for project repayment and water service was reviewed.

PROJECT DEVELOPMENT

The project development program involves preparation of comprehensive plans for development of river basin resources and the investigation and planning of potential projects for the conservation and utilization of the water resources of the West. It also includes detailed preconstruction work on newly authorized projects awaiting the initial allotment of construction funds.

Comprehensive Basin Surveys

During fiscal year 1956, the Bureau of Reclamation was engaged in comprehensive surveys in 13 basins throughout the West. Of these, the studies in the San Luis Obispo County Basin and the Santa Ynez River Basin were completed and by the end of the fiscal year, field work on the Upper American River Basin survey was substantially completed. Final review of the comprehensive report on the Arkansas-White-Red River Basins was completed by concerned Federal agencies and the report was transmitted to the Congress by the Director, Bureau of the Budget, on June 18, 1956.

Permanent authorization was provided for the Bureau's investigation program in Alaska which in the past had been carried forward on a year-to-year basis on language in the annual appropriation acts.

Project Planning Reports

Feasibility reports were completed on the Norman project in Oklahoma, the Harlingen and Mercedes division of the Lower Rio Grande rehabilitation project in Texas and the Rio Grande and Weminuche Pass divisions of the San Luis Valley project in Colorado, and the reports were under review by the affected States and interested Federal agencies. By the close of the year reports had been submitted to the Department for the Palisades reregulating dam and reservoir in Idaho and the San Angelo project in Texas preparatory to their being submitted to the States and Federal agencies and for the San Luis Valley unit of the Ultimate Central Valley project preparatory to its being submitted to the Bureau of the Budget.

Definite Plan Reports

During the fiscal year a definite engineering plan was prepared for the Palo Verde diversion project, Arizona-California, and definite plan reports were prepared, reviewed, and approved for the following projects:

Chief Joseph Dam project, Foster Creek division, Washington.
Michaud Flats project, Idaho.
Rogue River Basin project, Talent division, Oregon.
Santa Maria project, California.

River Compacts

Legislation was passed granting consent of the Congress to the negotiation of compacts between the States of Oregon and California regarding the Klamath River; the States of Kansas and Oklahoma concerning the Arkansas River; the States of Arkansas, Louisiana, Oklahoma, and Texas regarding the Red River; and the States of California and Nevada regarding the Truckee, Carson, and Walker Rivers.

Hydrology

Studies have been performed in several of the basic problem areas experienced in hydrologic investigations of proposed reclamation projects, encompassing the fields of flood control, sediment, water utilization, and evaporation.

Flood studies involving snowmelt and interflow problems and complex storm patterns were developed utilizing the Blackfoot and the Beaverhead River Basins in Montana as data source areas.

Investigation of evaporation along several lines has continued in collaboration with the Geological Survey. The final report on the Lake Mead study was released to the public. High-altitude studies at Granby Reservoir, and ultra-high-altitude study on Pikes Peak, both in Colorado, were initiated to assist in evaluating reservoir evaporation in the higher and more remote areas of the Western States.

Evaluation of river flow forecasting methods of the Bureau of Reclamation by comparison with those of other agencies was continued.

Investigation in collaboration with the Geological Survey of total sediment transport covered the computation of total sediment transport in alluvial streams for flows with no ice cover and temperatures of 32° F. to 39° F.; improvement of techniques for bed material sampling, and the comparison of the equal transit rate method of suspended sampling with current procedures.

International Streams Investigations

The Bureau of Reclamation is represented on two International Engineering Boards of the United States section of the International Joint Commission. The Souris-Red Rivers Engineering Board continued its engineering studies of the Souris River for use of the Commission in its consideration of an apportionment of waters of that international stream between the United States and Canada under the Souris-Red Rivers reference of January 12, 1948. During the fiscal year the Waterton-Belly Rivers Engineering Board was inactive in connection with the Waterton-Belly Rivers reference of the same date.

PROGRAM COORDINATION AND FINANCING

Greater efficiency in the maintenance of detailed work schedules and statistical services essential to the estimating, financing, accounting, and reporting of the Federal reclamation program was achieved by continued refinement of bookkeeping and reporting procedures in the Bureau during 1956 fiscal year.

Programing of operation and maintenance activities on an organizational rather than a functional basis was instituted and proved to be simpler to prepare and more informative than the method previously used.

Financial operations included plans for the preparation annually of a "Statement of Project Costs and Repayment"; a uniform guide for compliance factors, accounting procedures, and internal controls; study of developments in the field of electronics and other mechanical equipment; and centralization of accounting in regional offices.

Inquiries by the Bureau of the Budget and the introduction of legislation in the Congress indicated the possibility of a requirement to prepare appropriation requests on the basis of costs rather than obligations. In anticipation of this change, studies were made to determine the applicability of existing scheduling procedures to such a requirement. This analysis indicated that the Bureau's activity programs as presently prepared will meet the requirements of a cost-type budget presentation with little or no revision.

Statistical periodicals provided throughout the year included the Monthly Report on Progress and Status of Funds, Monthly Program

Briefs, Monthly Federal Civilian Employment, Bureau Quarterly Progress, Quarterly Office Budget—Employment, Statistical Appendix to Commissioner's Annual Report, Fund Tables, Commissioner's Cost Report and other related interim reports and chart exhibits on all activities as the official source for frequently required administrative and management data.

The Bureau's initial Annual Consolidated Financial Report for fiscal year 1955 was compiled. Plans were completed for preparing manuscript and publishing new editions of the three related volumes entitled "Reclamation Project Feasibilities and Authorizations," "Reclamation Appropriation Acts and Allotments," and "Reclamation Repayment Histories and Payout Schedules," to bring these 1952 publications up to 1957 in accordance with the 5-year timing element of the Bureau's long-range statistical publication program.

BUDGET

Appropriations made available to the Bureau of Reclamation for fiscal year 1956 totaled $180,155,000 including $160,000 in supplemental funds to cover the cost of pay increases authorized by Public Law 533. This does not include revolving funds or in permanent appropriations. The appropriation for 1956 was $16,948,000 more than was appropriated for fiscal year 1955.

With an unobligated balance of $17.3 million, plus funds advanced by water users, trust funds, and a continuing fund for emergency expenses, Fort Peck project, the money available to Reclamation was $208.6 million. Of this amount there remained unobligated at the close of 1956 funds in the amount of $36.2 million.

Obligations for 1956 totaled $172.4 million or 83 percent of the obligations programed as compared with 94 percent of the program accomplished in 1955.

The 1956 Appropriation Act, as in recent years imposed certain restrictions upon the Bureau. The Bureau was again directed not to initiate construction on transmission facilities in areas covered by power wheeling contracts unless the wheeling agencies were unable or unwilling to provide this service.

The limitation on the amount of money which may be expended for work by Government forces (force account work) was repeated in the 1956 act. This limitation provided that not to exceed 12 percent of the allotment for any one project or unit of the Missouri River Basin project, with a maximum of $225,000 for any such project or unit, was to be so used. Also again as in recent years a limitation was placed upon the amount of money that could be expended for information services. By administrative determination this limitation was placed at $18,250.

The amounts appropriated by activity for fiscal year 1956, together with the amounts to be derived from the special and general funds, follow:

Table 12.—*Condensed statement of appropriations, fiscal year 1956 exclusive of trust funds and permanent appropriations*

General investigations	$5,104,000
Reclamation fund	(4,421,812)
Colorado River dam fund, Colorado River development fund	(532,188)
General fund	(150,000)
Construction and rehabilitation	146,041,000
Reclamation fund	(69,287,000)
General fund	(76,754,000)
Operation and maintenance	24,750,000
Reclamation fund	(20,171,138)
Colorado River dam fund	(1,749,500)
General fund	(2,829,362)
General administrative expenses	3,760,000
Reclamation fund	(3,760,000)
Emergency fund	500,000
Reclamation fund	(500,000)
Grand total	180,155,000
Reclamation fund	(98,139,950)
Colorado River dam fund	(2,281,688)
General fund	(79,733,362)

Table 13.—*Annual appropriations from reclamation and other funds, fiscal years 1902–56*

Fiscal year	Reclamation fund [1]	General fund	Colorado River dam fund	Emergency relief funds [2]	Fort Peck continuing fund	Permanent appropriations	Total
1902	[3] $165,000	----	----	----	----	----	(3)
1903	[3] 5,950,000	----	----	----	----	----	(3)
1904	[3] 18,440,000	----	----	----	----	----	[3] $2,000,000
1905	[3] 8,758,000	----	----	----	----	----	(3)
1906	[3] 24,894,961	----	----	----	----	----	[3] 15,363,800
1907	[3] [4] 41,979,161	----	----	----	----	----	(3)
1907	19,186,161	----	----	----	----	----	[3] 18,051,161
1908	9,562,038	----	----	----	----	----	9,562,038
1909	9,180,700	----	----	----	----	----	9,180,700
1910	8,183,300	----	----	----	----	----	8,183,300
1911	26,896,790	----	----	----	----	----	26,896,790
1912	8,262,367	----	----	----	----	----	8,262,367
1913	8,300,508	----	----	----	----	----	8,300,508
1914	15,931,922	----	----	----	----	----	15,931,922
1915	1,261,411	----	----	----	----	----	1,261,411
1916	13,530,000	----	----	----	----	----	13,530,000
1917	8,887,557	$15,000	----	----	----	----	8,902,557
1918	8,227,000	310,213	----	----	----	----	8,537,213
1919	9,397,081	443,196	----	----	----	----	9,840,277
1920	7,300,000	548,927	----	----	----	----	7,848,927
1921	8,463,000	661,177	----	----	----	----	9,124,177
1922	20,266,000	335,871	----	----	----	----	20,601,871
1923	14,800,000	559,530	----	----	----	----	15,359,530
1924	13,800,000	314,067	----	----	----	----	14,114,067
1925	11,890,809	----	----	----	----	----	11,890,809
1926	12,563,240	687,336	----	----	----	----	13,250,576
1927	7,436,320	75,000	----	----	----	----	7,511,320
1928	12,148,800	122,640	----	----	----	----	12,271,440
1929	14,328,400	115,000	----	----	----	----	14,443,400
1930	8,643,000	10,760,000	----	----	----	----	19,403,000
1931	9,482,000	100,000	----	----	----	----	9,582,000
1932	7,271,000	25,100,000	----	----	----	----	32,371,000
1933	2,817,288	13,050,000	----	----	----	----	15,867,288
1934	3,408,000	8,048,000	----	$103,535,000	----	----	114,991,000
1935	1,176,750	----	----	34,076,000	----	----	35,252,750
1936	1,388,100	15,950,000	----	25,438,000	----	----	42,776,100
1937	12,344,600	34,850,000	$350,000	[4] 4,873,000	----	----	42,671,600
1938	12,322,600	30,570,000	500,000	37,047,500	----	$1,100,000	81,540,100
1939	10,940,600	32,995,000	500,000	[4] 2,502,488	----	4,600,000	46,533,112
1940	13,875,600	64,215,000	575,000	28,347	----	5,700,000	84,393,947
1941	10,000,600	63,260,000	768,000	[4] 124,300	----	6,600,000	80,504,300
1942	8,111,000	92,862,031	1,000,000	[4] 19,961	----	2,600,000	104,553,070
1943	3,607,960	86,745,460	1,379,250	[4] 1,131	----	2,600,000	94,331,539
1944	4,514,475	35,712,000	1,443,100	[4] 72,709	$300,000	5,600,000	47,496,866
1945	7,649,800	18,637,200	2,200,000	[4] 22,332	100,000	13,100,000	41,664,668
1946	36,617,890	83,527,750	2,550,000	----	200,000	4,856,302	127,751,942
1947	39,600,213	75,901,805	1,814,330	[4] 30,396	----	4,600,000	121,885,952
1948	25,676,750	115,505,288	2,088,000	----	308,000	5,280,000	148,858,038
1949	36,952,264	227,636,453	2,450,000	----	355,000	4,440,000	271,833,717
1950	44,759,817	312,269,875	2,123,100	----	403,229	7,641,440	367,197,461
1951	46,917,165	222,453,635	2,308,000	----	358,605	5,694,729	277,732,134
1952	51,422,347	180,665,175	2,171,000	----	634,900	6,665,088	241,558,510
1953	72,945,450	130,859,541	2,643,000	----	695,796	7,743,965	214,887,752
1954	74,884,496	65,505,454	2,679,710	----	633,802	4,610,748	148,314,210
1955	83,553,419	75,444,114	2,442,778	----	735,900	5,953,500	168,129,711
1956	98,139,950	79,733,362	2,281,688	----	715,881	4,403,500	185,274,381
Total	1,015,055,338	2,106,545,100	34,266,956	192,478,530	5,441,113	[5] 103,789,272	3,457,576,309

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[1] Prior to fiscal year 1916 funds were made available to Reclamation Service by allotments from the reclamation fund, authorized by the Secretary of the Interior.

[2] Emergency relief funds include allocations to Reclamation from NIRA, PWA, and ERA funds.

[3] Allotments made prior to Fallon, Nev., Conference on July 27, 1907, were canceled and summary allotments issued. Original amounts excluded from total column.

[4] Credit.

[5] Repayment of advances included: Boulder Canyon, $21,952,606 and All-American Canal system, $3,052,000.

TABLE 14.—*The reclamation fund, fiscal years 1955–57, funds available for appropriation*

Receipts and appropriations	Actual 1955	Actual 1956	Estimated 1957
Unappropriated balance brought forward (as of June 30)	$88, 033, 071	$92, 751, 703	$87, 217, 904
Add items intransit			16, 011
Accretions and collections:			
Bureau of Reclamation and other agencies, .100	16, 014, 551	11, 970, 724	15, 436, 600
Other agencies, .200	32, 282, 541	35, 583, 729	39, 914, 200
Power revenues, .300	38, 462, 092	43, 736, 392	46, 825, 400
Subtotal, accretions and collections	86, 759, 184	91, 290, 845	102, 176, 200
Plus lapsed appropriations	1, 666, 367	1, 318, 806	950, 000
Plus returned from fiscal year 1956 O. and M. for fiscal year 1956, increased pay costs		52, 500	
Total available for appropriation	176, 458, 622	185, 413, 854	190, 360, 115
Less permanently authorized appropriations for:			
Refund of revenue collections	150, 000		125, 000
Farmers' irrigation district, North Platte project, Nebraska	3, 500	3, 500	8, 000
Deduct annual appropriation or estimate for:			
General investigations	3, 150, 000	4, 421, 812	4, 970, 000
Construction and rehabilitation	57, 946, 197	69, 287, 000	63, 083, 000
Operation and maintenance	18, 257, 222	[1] 20, 223, 638	22, 055, 700
General administrative expenses	4, 000, 000	[2] 3, 760, 000	3, 942, 000
Emergency fund	200, 000	500, 000	
Total annual appropriation or estimate	83, 553, 419	98, 192, 450	94, 050, 700
Total appropriations	83, 706, 919	98, 195, 950	94, 183, 700
Balance carried forward	92, 751, 703	87, 217, 904	96, 176, 415

[1] Of this amount $52,500 was returned to the receipt account to be appropriated for fiscal year 1956, increased pay costs.

[2] Of this amount $160,000 was appropriated for fiscal year 1956, increased pay costs.

Table 15.—*Accretions to reclamation fund by States, fiscal year 1956*

State	Sale of public land		Proceeds from Oil Leasing Act		Total to June 30, 1956
	Fiscal year 1956	To June 30, 1956	Fiscal year 1956	To June 30, 1956	
Alabama	----------	----------	$349.92	$209,260.58	$209,260.58
Arizona	$97,616.88	$3,160,956.82	32,141.72	378,344.74	3,539,301.56
Arkansas	----------	----------	12,459.57	31,813.86	31,813.86
California	449,339.55	10,801,181.40	4,563,891.73	65,575,032.54	76,376,213.94
Colorado	164,512.71	11,231,668.14	4,565,668.97	29,637,054.59	40,868,722.73
Florida	----------	----------	232.32	2,169.96	2,169.96
Idaho	262,832.96	8,223,682.78	164,760.48	725,237.60	8,948,920.38
Illinois	----------	----------	32.81	74.81	74.81
Kansas	753.41	1,046,296.83	72,930.76	415,066.69	1,461,363.52
Louisiana	----------	----------	134,876.96	723,288.13	723,288.13
Michigan	----------	----------	2,263.78	27,910.65	27,910.65
Mississippi	----------	----------	2,877.20	16,757.61	16,757.61
Montana	201,488.68	16,290,654.66	1,296,073.13	11,087,957.25	27,378,611.91
Nebraska	3,326.78	2,213,307.22	7,034.47	59,514.98	2,272,822.20
Nevada	255,726.35	1,463,705.74	749,012.86	2,981,564.65	4,445,270.39
New Mexico	97,217.90	7,289,785.89	5,254,018.34	35,941,036.88	43,230,822.77
North Dakota	10,881.59	12,285,252.64	127,921.02	808,707.58	13,093,960.22
Oklahoma	582.32	5,969,392.02	31,124.22	227,401.15	6,196,793.17
Oregon	724,726.66	15,296,269.33	129,052.81	236,348.80	15,532,618.13
South Dakota	45,060.41	7,840,995.95	135,700.16	620,815.66	8,461,811.61
Utah	91,362.63	4,893,460.56	2,101,847.87	11,701,916.77	16,595,377.33
Washington	190,573.93	8,736,258.23	10,552.36	72,892.68	8,809,150.91
Wyoming	122,797.69	9,465,490.32	11,755,901.57	114,839,460.05	124,304,950.37
Total	2,718,800.45	126,208,358.53	31,150,725.03	276,319,628.21	402,527,986.74

Other accretions

	Fiscal year 1956	Totals to June 30, 1956
Proceeds, Federal water-power licenses	$43,973.67	$1,458,593.39
Proceeds, potassium royalties and rentals	1,669,858.95	10,939,492.12
Receipts from naval petroleum reserves, 1920–38, act of May 9, 1938	----------	29,778,300.23
Proceeds from rights-of-way over withdrawn lands, act of July 19, 1919	370.85	12,008.04
Miscellaneous items, other	----------	5.78
Total	1,714,203.47	42,188,399.56
Grand total	35,583,728.95	444,716,386.30

TABLE 16.—*Cost of plant, property and equipment, by States, June 30, 1956*

State and project	Completed works					Construction in progress	Other physical property	Total
	Multipurpose (1)	Irrigation (2)	Electric (3)	Municipal water (4)	Flood control (5)	(6)	(7)	(8)
Total	$1,003,032,411	$898, 255, 111	$620, 326, 586	$14, 041, 374	$12, 938, 158	$272, 070, 629	$15, 044, 441	$2, 835, 708, 710
(Alaska): Eklutna			32, 368, 539			8, 149		32, 376, 688
Arizona, subtotal	90, 810, 434	52, 138, 854	107, 705, 473		3, 454, 942	8, 832, 004	106, 848	263, 048, 555
Boulder Canyon:								
All-American Canal system (California)	2, 179, 950					2, 019		2, 181, 969
Hoover Dam and powerplant (Nevada)	44, 610, 662		33, 523, 773			55, 743		78, 190, 178
Colorado River front work and levee system (California-Nevada)					3, 454, 942	4, 731		3, 459, 673
Gila		36, 785, 777				6, 971, 447	106, 848	43, 864, 072
Palo Verde diversion (California)						243, 473		243, 473
Parker-Davis (California-Nevada)	38, 794, 932		69, 803, 220			1, 512, 818		110, 110, 970
Salt River	5, 224, 890	10, 753, 355	4, 266, 443					20, 244, 688
Yuma (California)		3, 542, 161	112, 037					3, 654, 198
Yuma auxiliary		1, 057, 561				41, 773		1, 099, 334
California, subtotal	297, 737, 787	193, 807, 215	125, 326, 629		9, 108, 166	51, 784, 316		677, 764, 113
Boulder Canyon: All-American Canal system (Arizona)	38, 459, 058	16, 720, 336	45, 090		3, 329, 786	64, 959		58, 619, 229
Cachuma	23, 791, 897					19, 132, 769		42, 924, 666
Central Valley	230, 132, 139	165, 251, 300	106, 349, 371			12, 162, 387		513, 895, 197
Colorado River front work and levee system (Arizona-Nevada)					5, 778, 380	57, 862		5, 836, 242
Klamath (Oregon)		6, 088, 700				69, 761		6, 158, 461
Orland		2, 583, 870						2, 583, 870
Palo Verde diversion (Arizona)						786, 512		786, 512
Parker-Davis (Arizona-Nevada)	5, 354, 693		18, 449, 846			13, 799		23, 818, 338
Santa Maria						729, 551		729, 551
Solano						18, 761, 149		18, 761, 149
Truckee storage (Nevada)								
Yuma (Arizona)		3, 163, 009	482, 322			5, 567		3, 650, 898
Colorado, subtotal	53, 415, 784	105, 346, 129	41, 988, 129			187, 687		200, 937, 729
Colorado-Big Thompson	36, 266, 667	80, 349, 030	41, 126, 673			38, 019		157, 780, 389
Fruitgrowers Dam		200, 309						200, 309
Grand Valley		6, 866, 731	213, 669			96, 469		7, 176, 869
Mancos		3, 906, 362						3, 906, 362
Missouri River Basin	13, 279, 498		647, 787			38, 878		13, 966, 163

		1, 602, 687						1, 602, 687
Pine River		3, 455, 051				12, 725		3, 467, 776
San Luis Valley	3, 869, 619					1, 596		3, 871, 215
Uncompahgre		8, 965, 959						8, 965, 959
Idaho, subtotal	42, 702, 249	45, 065, 651	7, 774, 231	1, 020, 096		55, 307, 134	67, 458	151, 936, 819
Avondale		238, 491				6, 044		244, 535
Boise (Oregon)	33, 129, 761	25, 921, 187	5, 030, 810			185, 319		64, 267, 077
Dalton Gardens		258, 660						258, 660
King Hill		1, 877, 732						1, 877, 732
Lewiston Orchards	426, 999	1, 037, 302		1, 020, 096				2, 484, 397
Michaud Flats						459, 802		459, 802
Minidoka (Wyoming)	8, 634, 010	13, 897, 819	2, 743, 421			3, 256, 519	67, 458	28, 599, 227
Owyhee (Oregon)		902, 000				57, 974		959, 974
Palisades (Wyoming)	511, 479					51, 063, 238		51, 574, 717
Preston Bench		450, 100						450, 100
Rathdrum Prairie		482, 360						482, 360
Rogue River						278, 238		278, 238
Iowa:								
Missouri River Basin transmission lines			1, 144, 700			1, 136, 536		2, 281, 236
Kansas, subtotal	27, 362, 597	1, 139, 098				22, 986, 960		51, 488, 655
Garden City		334, 475						334, 475
Missouri River Basin	27, 362, 597	804, 623				22, 986, 960		51, 154, 180
Minnesota: Missouri River Basin transmission lines						2, 382, 213		2, 382, 213
Montana subtotal	99, 863, 220	32, 301, 266	41, 150, 241			24, 157, 312	236, 560	197, 708, 599
Bitter Root		1, 000, 212				31, 823		1, 032, 035
Buffalo Rapids		4, 573, 987				96, 164		4, 670, 151
Fort Peck (North Dakota)			10, 154, 127			242, 454		10, 396, 581
Frenchtown		290, 797						290, 797
Hungry Horse	79, 447, 032		22, 086, 052			67, 658		101, 600, 742
Huntley		1, 552, 159						1, 552, 159
Intake		87, 513						87, 513
Lower Yellowstone (North Dakota)		3, 037, 418						3, 037, 418
Milk River		9, 385, 945				267, 595		9, 653, 540
Missoula Valley		278, 320						278, 320
Missouri River Basin	20, 416, 188	2, 053, 207	8, 910, 062			23, 406, 098	236, 560	55, 022, 115
Shoshone (Wyoming)		16, 400						16, 400
Sun River		10, 025, 308				45, 520		10, 070, 828
Nebraska, subtotal	36, 981, 485	38, 550, 523	7, 283, 061			6, 815, 559		89, 630, 628
Mirage Flats		3, 061, 631						3, 061, 631
Missouri River Basin	36, 981, 485	26, 348, 259	7, 043, 082			6, 673, 591		77, 046, 417
North Platte (Wyoming)		9, 140, 633	239, 979			141, 968		9, 522, 580

TABLE 16.—*Cost of plant, property and equipment, by States, June 30, 1956*—Continued

State and project	Completed works: Multipurpose (1)	Irrigation (2)	Electric (3)	Municipal water (4)	Flood control (5)	Construction in progress (6)	Other physical property (7)	Total (8)
Nevada, subtotal	$53, 471, 187	$9, 861, 880	$36, 109, 538		$102, 123	$218, 632	$7, 414, 517	$107, 177, 877
Boulder Canyon:								
Hoover dam and powerplant (Arizona)	50, 041, 226		32, 088, 274			173, 190	1, 712, 052	84, 014, 742
Boulder City Municipal							5, 702, 465	5, 702, 465
Colorado River front work and levee system (Arizona-California)					102, 123	4, 731		106, 854
Humboldt		1, 214, 321				31, 987		1, 246, 308
Newlands		7, 555, 136	344, 343					7, 899, 479
Parker-Davis (Arizona-California)	3, 429, 961		3, 676, 921			8, 724		7, 115, 606
Truckee Storage (California)		1, 092, 423						1, 092, 423
New Mexico, subtotal	16, 232, 022	35, 043, 597	7, 815, 493		272, 927	4, 688, 161		64, 052, 200
Carlsbad	3, 155, 028	2, 065, 771						5, 220, 799
Fort Sumner		2, 371, 407						2, 371, 407
Hondo		339, 377						339, 377
Middle Rio Grande	3, 546, 424	8, 200, 199				4, 546, 341		16, 292, 964
Rio Grande (Texas)	8, 132, 596	5, 541, 400	7, 815, 493		272, 927	127, 977		21, 890, 393
Tucumcari		15, 474, 365						15, 474, 365
Vermejo	1, 397, 974	1, 051, 078				13, 843		2, 462, 895
North Dakota, subtotal	8, 891, 394	3, 349, 502	21, 134, 826			6, 781, 883		40, 157, 605
Buford-Trenton		1, 006, 152						1, 006, 152
Buford-Trenton (old)		223, 423						223, 423
Fort Peck (Montana)			1, 528, 456			647		1, 529, 103
Lower Yellowstone (Montana)		555, 682						555, 682
Missouri River Basin	8, 891, 394	1, 155, 150	19, 606, 370			6, 781, 236		36, 434, 150
Williston		409, 095						409, 095
Oklahoma: W. C. Austin	6, 955, 676	5, 144, 860		$152, 027				12, 252, 563
Oregon, subtotal		48, 815, 006	516, 002			665, 748	13, 332	50, 010, 088
Arnold								
Baker		281, 589						281, 589
Boise (Idaho)		4, 275						4, 275
Burnt River		601, 026						601, 026
Crescent Lake Dam						276, 405		276, 405
Deschutes		11, 596, 561	447, 366			236, 768		12, 280, 695

Ochoco								
Owyhee (Idaho)		17,976,465				48,148		18,024,613
Umatilla		5,311,153						5,311,153
Vale		4,866,824						4,866,824
South Dakota, subtotal	17,636,201	8,506,339	33,030,166			16,522,487	73,630	75,768,823
Belle Fourche		5,000,791						5,000,791
Missouri River Basin	16,715,978	3,505,548	33,030,166			16,522,487	73,630	69,847,809
Rapid Valley	920,223							920,223
Texas, subtotal	23,439,644	5,273,938				46,843		28,760,425
Balmorhea		406,533						406,533
Colorado River	23,439,644							23,439,644
Falcon								
Rio Grande (New Mexico)		4,867,405				46,843		4,914,248
Utah, subtotal	16,304,059	18,507,794	91,969	12,869,251		19,745,973	61,086	67,580,132
Hyrum		953,854						953,854
Moon Lake		1,799,859						1,799,859
Newton		712,592						712,592
Ogden River		5,013,283						5,013,283
Provo River	15,360,222	3,708,875		12,869,251		469,105		32,407,453
Sanpete		433,940						433,940
Scofield	943,837							943,837
Strawberry Valley		3,345,939	91,969				61,086	3,498,994
Weber Basin						19,276,868		19,276,868
Weber River		2,539,452						2,539,452
Washington, subtotal	165,397,710	238,134,157	108,552,860			33,590,881	3,065,707	548,741,315
Chief Joseph Dam						254,972		254,972
Columbia Basin	160,949,436	197,670,606	107,165,592			20,950,537	3,065,707	489,801,878
Okanogan		1,484,324				21,305		1,505,629
Yakima	4,448,274	38,979,227	1,387,268			12,364,067		57,178,836
Wyoming, subtotal	45,830,962	57,269,302	48,334,729			16,212,151	1,000,403	168,647,547
Eden		3,783,436				1,478,341		5,261,777
Kendrick	5,166,889	9,869,691	15,120,826			235,465		30,392,871
Minidoka (Idaho)		2,209,904						2,209,904
Missouri River Basin	32,831,967		27,958,903			12,693,825	11,582	73,496,277
North Platte (Nebraska)	3,292,933	8,861,597	1,350,672			105,108		13,610,310
Palisades (Idaho)						842,181		842,181
Riverton	2,968,699	16,597,547	472,293			683,778	988,821	21,711,138
Shoshone (Montana)	1,570,474	15,947,127	3,432,035			173,453		21,123,089
Nonproject property							3,004,900	3,004,900

NOTES.—Name of State in which balance of project is located is indicated by parentheses (except Missouri River Basin, located in 10 States). Irrigation plant listed at gross construction cost prior to deduction of chargeoffs authorized by Congress.

ADMINISTRATION

Strengthening of the various segments of service elements in the Bureau organization was carried forward in 1956 to insure continuing efficient administration of the Federal reclamation program.

Responsibility for Bureau activities is vested in the Commissioner of Reclamation. The Assistant Commissioner and Chief Engineer directs operations of the engineering center in Denver, Colo. Regional offices under the supervision of Regional Directors are located at Boise, Idaho; Sacramento, Calif.; Boulder City, Nev.; Salt Lake City, Utah; Amarillo, Tex.; Billings, Mont.; and Denver, Colo. An Alaska District Office, headed by a district manager, is maintained in Juneau.

Highlights of accomplishment in the administration of the Bureau during the 1956 fiscal year were:

Property Management

Examination of internal functions and activities was continued in an effort to identify and, where feasible, to discontinue any such functions and activities which were in competition with private enterprise. As a concrete example of the results of this undertaking, it was decided privately owned printing plants in the Nevada-California area could adequately handle printing formerly performed by our own employees in that area, and such plants were invited to bid to perform this work without competition from our own printers.

During the year the Bureau disposed of unneeded real property having an acquisition cost of $3,761,105, resulting in a substantial reduction in costs of operating and maintaining such property. The Bureau disposed of 750 housing units, 22 percent of its housing, which were either no longer needed in connection with program activities or were located in areas where private housing was available.

Disposal of trailer houses and demountable-type houses was curtailed in anticipation of an expanded construction program. Several of such units were rented to other bureaus of the Department and other Government agencies on a short-term basis. Retention of these units paid handsome dividends, as nearly all have been put to use at new construction sites within the Bureau, thus saving the acquisition cost of replacement units.

Organization and Methods

Operating offices of the Bureau were established, abolished, or adjusted as to scope and staff in keeping with the progress of the Bureau's program. Principal activity in this respect related to the formation of field organizations and staffing requirements for the units of the Upper Colorado River storage project.

The Incentive Awards Program increased in all respects. A total of 831 suggestions was received from employees. Of those evaluated, 362, or 46 percent, were adopted. Tangible savings of $132,028, plus intangible benefits, were realized for which $9,630 was paid in cash awards. Superior performance awards were presented to 159 employees for outstanding performance of duties; and four special act awards were granted for specific improvements in Bureau operations. Considerable intangible benefits were gained through the operation of the incentive awards program. These were in the form of better employee morale, increased job satisfaction, and a greater sense of achievement through the wise use of manpower, money, and materials.

General Services

The volume of stored Bureau records was reduced within the fiscal year from 123,000 cubic feet to 112,000 cubic feet. Savings of approximately $155,000 in the cost of space and equipment alone resulted from the disposition of 18,500 cubic feet of documents by destruction or by transfer to low-cost space.

In response to 3,300 requests for the Bureau's publications and informational material received from individuals in this country and in foreign countries, more than 12,000 copies of technical publications and informational pamphlets were sold at Denver or distributed from there. Sales of Bureau publications at Denver totaled $24,300, approximately one-half of this total being made to foreign countries. Sales of publications sold by the Bureau as agent for the Superintendent of Documents totaled $7,800.

In response to 800 requests for Bureau publications, the Publications Branch at Washington, D. C., distributed 12,500 copies. Of these requests, 150 were of congressional origin for 545 publications and 170 were from agencies of the executive branch of the Federal Government for 1,425 copies.

The branch at Washington received 160 requests for photographs for illustration or exhibition purposes. One thousand four hundred prints were provided for reproduction in Bureau publications, non-Government text books and encyclopedias, various agricultural and engineering magazines and newspapers, and to supplement exhibits and lectures. Requests by mail and in person for visual materials were also received from congressional offices and from agencies of the executive branch of the Federal Government. Some of this material was published, and some was exhibited or used to illustrate lectures in the United States or abroad.

Six hundred ninety-six films were distributed to television stations, agricultural and engineering institutions, water users' associations, organizations of farmers, and to conventions in the United States and abroad. The greatest number of requests were for the Bureau's construction film, Hoover Dam.

General Engineering

Coordination and liaison was maintained throughout fiscal year 1956 with the Department of the Interior, the Renegotiation Board, General Accounting Office, the Department of Labor, and other agencies on matters relating to the Bureau's activities.

The Bureau participated in the work of the Departmental Advisory Board on Safety and in the activities of the Departmental Safety Council. A highly successful record was established by the Bureau in its participation in the National No-Accident Week. An award to the construction forces of Webster Dam, Kansas, for 4 years without a single disabling lost-time injury or motor-vehicle accident was approved by the Secretary of the Interior, and a gold seal certificate and citation of outstanding safety performance presented shortly after the close of the fiscal year.

The Bureau's participation in professional, scientific, and technical activities, and committee assignments was reviewed and coordinated. A grant was awarded to the Bureau by the National Science Foundation for basic research in concrete.

Arrangements were carried out for participation and the presentation of papers at international meetings of the World Power Conference, the International Commission on Large Dams, CIGRE, and the International Commission on Irrigation and Drainage, and for the exchange of technical and scientific information with these organizations.

Comptroller

During the past year added emphasis was placed on the constructive aspects of audit reporting, both as to quality and effectiveness of reports, and the highlighting for management of the more significant segments of audit determinations. Special effort was also concentrated on the major aspects of financial administration and the adequacy, accuracy, and effectiveness of the accounting system. With management support, timely and speedy consideration has been given to the recommendations in the audit reports.

Fifty-four field audit assignments were completed during fiscal year 1956. Included were 40 financial audits of individual projects; 3 financial audits of water users' organizations performed at their request; 2 special audits; 2 audits of power and multipurpose operations of project units; and 3 special reports.

Members of the Comptroller's staff took an active part in effectuating compliance by the Bureau of Reclamation with Public Law 841, 80th Congress. This legislation directed that expenditures for the Boulder Canyon project be segregated as between project and nonproject items. This work required the cooperative effort of the Washington, regional, and project offices. It has been completed and the provisions of the law have been fully complied with. In connection with the segregation of nonproject investment of the Boulder Canyon project, members of the Comptroller's staff also prepared an overall reconciliation of costs to funds.

Personnel

Fiscal year 1956, with its new project authorizations, brought about a need for increased attention to the conservation and effective utilization of the skills and experience possessed by career Bureau employees. This led to the initiation of action in several areas, all designed to aid in the effective accomplishment of Bureau objectives in natural resources development. Bureau employment increased from 9,607 full-time employees at the beginning of the year to 10,018 at the end, with almost all of the increase coming in the final month.

Programs for student and beginning engineer training were reformulated. Through these programs, and with increased attention given to college recruitment, the Bureau hopes to recruit, develop, and retain the professional and administrative engineering talent needed for accomplishing future Bureau programs. A total of 58 beginning engineers were hired during the year and 342 students in engineering were appointed for summer work.

An inventory was made of the development needs of all Bureau employees in grades GS–12 through GS–14. A summary sheet was obtained on each employee showing previous training and experience and listing kinds of further assignments that would ready him for more responsible positions. This information has been used to work out several exchange assignments which will permit employees to acquire broader experience. Further actions along these lines will be taken as circumstances permit. This will contribute to a more flexible, versatile, and effective work force.

Initial steps were taken leading to the establishment, early in fiscal year 1957, of an employee roster covering all employees in grades GS–9 through GS–14. This will provide for matching employee skills and position vacancies on a bureauwide basis. It will help to assure employees of continuity of employment and improve the manner in which they are considered and selected for filling vacancies.

FOREIGN ACTIVITIES

In fiscal year 1956, the Bureau of Reclamation continued its program of technical assistance at the request of the International Cooperation Administration which took over the work formerly administered by FOA, TCA, and Mutual Security Agency. The Bureau program includes three broad phases, (1) the training and development of foreign nationals in the techniques, processes, and practices of the Bureau of Reclamation, (2) the undertaking of laboratory studies, design review and other technical advice to agencies of foreign government, and (3) the selection of Bureau employees to act as technical advisers and to be part of actual work teams engaged in the training of foreign nationals and advising Government bureaus in planning and construction of irrigation and power projects in other lands. The Bureau also handled a number of requests for technical assistance from the Department of State, United Nations, International Bank for Reconstruction and Development, and other agencies, both public and private, directly concerned with water resource development throughout the world. It also, in cooperation with the Technical Review Staff, effects liaison on water resource matters with the Department of State's Office of International and Social Affairs, for the development and representation of the United States position before the United Nations.

The Division planned, coordinated, and guided the program of 127 inservice trainees during fiscal year 1956, including engineers and government officials from 22 different countries. In addition, there were 67 official observers and 91 accredited visitors representing 21 different countries. The Bureau also coordinated the selection and participation of individual specialists and missions of Reclamation technicians to other countries. At the close of the fiscal year, there were 28 people remaining on Reclamation rolls on overseas assignments, 1 in Ethiopia, 2 in Formosa, 3 in Iran, 12 in Lebanon, 1 in Pakistan, 3 in Turkey, 5 in Australia, and 1 in Thailand.

During the year the Bureau of Reclamation received $1,750,000 from various agencies for financing these technical assistance and training programs. The dollar volume of our technical assistance program was reduced from last year's $2,726,480, by the fact that approximately 50 fewer people in overseas positions were on the Bureau rolls.

Engineering services available in the Denver office continued in demand during the past year. Under the authority of Public Law 402, 80th Congress, and at the request of ICA, work was accomplished for Snowy Mountains Hydroelectric Authority, Australia; Wu Sheh and Shimen projects, Taiwan; Central Water and Power Commission, India; Chao Phya and Yan Hee projects, Thailand; Koka Dam project, Ethiopia; Rio Elqui project, Chile; and several projects in Lebanon.

LEGAL

The fiscal year ending June 30, 1956, was a productive one in terms of Reclamation legislation. Of general interest are the Acts of July 4, 1955, and May 14, 1956, providing for the construction of distribution systems under authorized reclamation projects by local water users' organizations, the act of June 13, 1956, providing for local construction of drainage work and other minor completion items, the act of May 10, 1956, repealing an archaic provision of the original Reclamation Act which prohibited the employment of Mongolian labor on reclamation construction jobs, and the act of August 9, 1955, providing a permanent statutory basis for the investigation by the Interior Department of water resource projects in Alaska. A bill to provide a system of loans and grants for the construction of small reclamation projects was signed into law shortly after the close of the fiscal year.

Major enactments in the field of project authorization cover the Colorado River storage and participating projects, the Trinity River division of the Central Valley project, the Ainsworth and Red Willow units of the Missouri River Basin project, and the Washita, Ventura, and Wapinitia projects. Bills providing authorization for the Crooked River and Little Wood River projects and reauthorization for the Farwell unit of the Missouri River Basin project were enacted by the Congress and signed into law after the close of the fiscal year.

Federal representation in interstate negotiations looking to compacts on the Klamath, the Arkansas, the Red, and the Truckee, Carson, and Walker Rivers has been provided for by legislation enacted during the year.

Bills authorizing the execution of amendatory repayment contracts with the Yuma County Water Users' Association (Yuma project) and the Yuma Mesa irrigation and drainage district (Gila project), making adjustments in the boundaries of the Yuma auxiliary project, deleting the incremental value provisions of the Arch Hurley conservancy district contract (Tucumcari project), authorizing service to the town of Glendo, Wyo., in connection with the Government's sewerage system at Glendo dam, and permitting temporary irrigation service to be furnished the Toston irrigation district from the works of the Crow Creek unit, Missouri River Basin project, also were enacted.

Litigation

Major litigation involving water and power problems during the year were:

1. *Rank* v. *Krug et al.*—A history of this case prior to June 30, 1955, appears on pages 85 and 86 of the 1955 annual report of the Secretary. On February 7, 1956, the United States District Court for the Southern District of California filed an opinion, dated February 6 (No. 685–ND), generally acceding to the plaintiffs' prayers for relief. The 247-page opinion, which has not as yet been published in the official reports, is that the court will grant an injunction against the defendants, requiring the water of the San Joaquin River to be let down into the river bed in the equivalent of the full natural flow of the stream to satisfy the rights of the plaintiffs; but that if the defendants will construct and operate a plan for a physical solution so as to supply the equivalent of the full natural flow, then all water over and above that required for the physical solution may be stored and diverted by Friant Dam and its related canals. The basic elements of the physical solution are discussed beginning on page 206 of the opinion.

On May 22 and 23, the court took further evidence concerning elements of the physical solution and on July 11 made and filed a supplemental memorandum, which states, among other things, the following:

> "* * * the present minimum requirements for the protection of the rights of plaintiffs and their class require, a decree of injunction prohibiting the impoundment and diversion of waters of the San Joaquin river at Friant, except upon condition that the defendants, at their cost, shall provide a physical solution by the construction of a minimum of ten dams * * *
>
> "* * * the release of sufficient water from Friant as will permit a continuous flow of five cubic feet per second over the last downstream dam, and also for flushing releases as indicated in plaintiffs' plan of physical solution."

No final order or decree has been entered.

2. *In the matter of the California Oregon Power Co.* (FPC project No. 2082).—This was a proceeding, in which the Secretary of the Interior intervened, on an application by Copco to the Federal Power Commission for a license for its proposed Big Bend No. 2 project. The Commission issued a license to Copco subject to the condition that it obtain an extension or renewal, for the 50-year term of the license, of a 1917 contract with the United States covering the operation of Link River Dam, or a new contract substantially similar to the 1917 contract. The Secretary of the Interior took no appeal from the Commission's decision. However, Copco appealed, on jurisdictional grounds, from the decision to the United States Court of Appeals for the District of Columbia. That court, while retaining jurisdiction, remanded the case to the Federal Power Commission to obtain the answers to certain questions. In Opinion No. 266–A, Supplemental

Opinion and Order Amending Order Issuing License, issued February 28, 1956, the Commission answered those questions. Supplemental materials were filed by Copco and the Federal Power Commission with the court.

In Opinion No. 266–A, the Commission also amended its previous order authorizing issuance of a license to Copco in order, among other things, to adjust certain terms and conditions of the preferred license to the provisions of the contract which had been made subsequently between Copco and Reclamation, dated January 31, 1956, covering the operation of Link River Dam for the period of the license. This contract satisfied the condition in the Commission's order referred to above.

3. *In the matter of the California Oregon Power Co.* (FPC Docket No. E–6390).—This proceeding was closely related to the proceeding on Copco's application for a license for the Big Bend No. 2 project. The Secretary of the Interior took no appeal from the Federal Power Commission's decision but Copco did. The appeal was consolidated with the appeal from the Commission's order in the related proceeding. The status of the appeal is described above.

4. *State of Arizona, plaintiff* v. *State of California et al.*—In this action in the Supreme Court of the United States, Arizona is seeking a determination of its rights in and to the use of the waters of the Colorado River, as against such rights claimed by the defendants, under the Colorado River compact, the Boulder Canyon Project Act, and the California Limitation Act. The Supreme Court announced on October 10, 1955, the appointment of Judge Simon H. Rifkind as Special Master to succeed the late George I. Haight, and formally received the latter's report, filed in July, on the motion of the California defendants that the Upper Basin States—Colorado, Wyoming, Utah, and New Mexico—be made parties to the suit. Following the former Special Master's recommendations, California's motion that the Upper Basin States be joined, as such, was denied by the Court December 12, 1955. The motion was granted regarding Utah and New Mexico, but only to the extent of their interest in lower basin waters. Special Master Rifkind held an organization meeting in New York City on January 30, 1956, and a pretrial conference at San Francisco, April 10 to 13, inclusive, at both of which all parties were represented. As a result of the San Francisco conference, the Special Master entered a pretrial order controlling the subsequent course of the action unless otherwise directed by him or by the Court. Extensive pleadings, motions, interrogatories, and related documents were filed on behalf of the several parties during the year. Trial of the case before Special Master Rifkind got underway at San Francisco on June 14, and was still in progress at the close of the fiscal year.

5. *Desert Beach Corp.* v. *United States, Imperial Irrigation District, Coachella Valley County Water District et al.*—This was an action seeking to recover $450,000 in damages to plaintiff's properties alleged to have been caused by the negligent and wrongful acts or omissions of the defendants in connection with the construction, operation and maintenance of the All-American Canal system and related irrigation works. The case was dismissed by the United States District Court for the Southern District of California, Central Division, June 5, 1956, for lack of prosecution.

6. *Arthur E. Graham, also known as Bud E. Graham* v. *United States.*—In this action in the United States District Court, District of Arizona, plaintiff seeks to recover $35,100 in damages to his property located downstream from Parker Dam, alleged to have resulted from defendant's negligence in connection with dredging operations of the Bureau of Reclamation on the Colorado River. The action is a sequel to a damage claim for the like amount, and rejected by the regional solicitor, Los Angeles region, on June 24, 1955, without consideration of its merits, pursuant to the Federal Tort Claims Act (28 U. S. C., secs. 2401, 2671–2680), which limits the authority of Federal agencies to determine and settle negligence claims against the United States to those not exceeding $1,000.

7. *Citizens Utilities Co.* v. *E. G. Nielsen* (an employee of the Bureau of Reclamation) *et al.*, United States Court of Appeals for the Ninth Circuit. This was an action originally instituted in the United States District Court for the District of Arizona on December 24, 1954, to enjoin and restrain the United States from doing or failing to do any act or thing which would cause or result in an interference with or disruption of the delivery of Hoover Dam electrical energy to the plaintiff company under its contract for purchase of unused metropolitan water district energy which terminated December 31, 1954. On January 24, 1955, plaintiff appealed from a judgment entered on January 21, 1955, dismissing the complaint and quashing the temporary restraining order issued thereunder. The appeal was dismissed without prejudice upon stipulation to that effect filed on July 29, 1955.

8. *Citizens Utilities Co.* v. *United States* and *California-Pacific Utilities Co.* v. *United States.*—Following dismissal of its appeal in the foregoing injunction suit, the Citizens Utilities Co. on September 30, 1955, filed suit in the Court of Claims for damages totaling $12,216,775 alleged to have been sustained as the result of the wrongful and unlawful failure and refusal of the United States to renew its contract for purchase of a portion of metropolitan water district's unused Hoover energy. On October 12, 1955, California-Pacific Utilities Co., holder of a similar energy contract terminated December 31, 1954, also filed suit for damages totaling $4,579,807 alleged to have been sustained by

reason of the wrongful and unlawful failure and refusal of the United States to renew its said contract. Defendant filed answer in each case, and the defendant's motion that the two cases be consolidated was granted by the court on December 29, 1955. Thereupon defendant filed its motion for leave to file motion for notice to third parties, and motion for notice to third parties, namely, the city of Los Angeles, Southern California Edison Co., California Electric Power Co., and the Metropolitan Water District of southern California. Defendant's motions were granted, and the notices to said parties were issued by the Clerk of the Court on February 1, 1956. On April 16, 1956, defendant filed motion for summary judgment and brief in support thereof.

9. *United States* v. *Ira R. Ure et al.* and *United States* v. *Fine Sheep Co.*, involved two suits against the United States under the Federal Tort Claims Act to recover for flooding of land following a break in an irrigation canal operated by the Bureau of Reclamation. The United States District Court for the District of Oregon rendered judgments for the landowners in 1950. The United States appealed. By decision dated September 12, 1955, the United States Court of Appeals, Ninth Circuit, held that the United States could not be held liable under the Federal Tort Claims Act for flooding of land either on the principle that one who permits a highly dangerous instrumentality or agency, located on his property and under his control, to escape and damage another is liable for damage irrespective of negligence or fault, or under common-law doctrine of liability without fault applicable in cases of trespass upon property of another. The court found that Government evidence was sufficient to rebut all inferences of Government negligence under doctrine of *res ipsa loquitur*. The case is reported in 225 F. 2d 709 (1955).

10. In *United States* v. *1,284.61 acres of land*, *more or less*, *in the county of Bonneville*, *State of Idaho; Floyd Bagley et al.*, the Government appraisal was $86,000 for land to be acquired for the Palisades project. Subsequent appraisals justified a stipulated settlement of $104,837.50. Judgment was entered May 28, 1956, in accordance with the stipulation.

11. In *United States* v. *1,001.99 acres of land*, *more or less*, *in the county of Bonneville*, *State of Idaho; Bert Ruud*, *et al.*, the Government appraisal totaled $152,250 for land required for the Palisades Reservoir. The case was tried November 7, 1955. On December 13, 1955, judgment on the verdict of $172,150 was entered. Defendants have asked for a new trial. Briefs have been filed by both parties and the Court has the case under consideration.

12. Two cases, both entitled *Provo Bench Canal & Irrigation Co. et al.* v. *Linke*, *State Engineer*, *and the United States*, to review decisions of the State engineer approving applications by the United States to change the point of diversion and place of use of water

acquired by the United States for the Provo River project, were tried on their merits in the District Court of the Fourth Judicial District in and for Utah County, State of Utah. The trial court decided the case adversely to the Government's petitions. On appeal, the Supreme Court of Utah reversed the decision of the State district court and remanded the cases with directions to approve the applications filed by the United States and approved by the State engineer.

13. *El Paso County Water Improvement District No. 1 and the United States et al.* v. *The city of El Paso*, was filed in the United States District Court, Western District of Texas, El Paso Division, in January 1953, to resolve a number of controversies existing between the litigants, including the extent of certain alleged water rights of the city, the validity of obligations previously entered into, the validity of conveyances of the Franklin Canal right-of-way, and obligations for maintenance of bridges. The district court, Dooley, judge, held, *inter alia*, that in view of compact among the States of Texas, New Mexico, and Colorado concerning the use of Rio Grande water, and in view of the United States appropriation of water for use of the water improvement district, the city of El Paso was not entitled to appropriate water already appropriated for use of the District. The case is reported in 133 F. Supp. 994 (1955).

14. *The Atchison, Topeka and Santa Fe Railway Co.* v. *United States.*—Petition was filed in the Court of Claims in February 1954 for damages allegedly arising in connection with the construction of Elephant Butte Dam from heavy siltation and sedimentation in the San Marcial area. Hearings were held by the Commissioners of the Court of Claims. No decision has been rendered.

Contract Litigation

Northern Pacific Railway Company v. *United States* was filed in the United States Court of Claims in October 1955 to recover $199,563.47 on cement shipments over plaintiff's railroad consigned to the Bureau of Reclamation at Odair, Wash., on the theory that the full commercial rates applied rather than the rates provided for in a special rate contract entered into between the parties in November 1934. This case is the fourth in a series of cases which have been filed periodically during the past 16 years. The same parties, the same rate contract, and some of the same issues are involved in these suits. Recovery was denied plaintiff in the first case. A nominal payment was made in the second case and it was dismissed. The third case for $122,531.62 and this case are pending.

BONNEVILLE POWER ADMINISTRATION

William A. Pearl, *Administrator*

FINANCIAL RESULTS OF OPERATIONS

WATER conditions for the generation of hydroelectric powers were considered to be good during the 1956 fiscal year. One small generating unit was added at Albeni Falls and two at Chandler. Four 70,000-kilowatt units at McNary and four 64,000-kilowatt units at Chief Joseph were energized during the fiscal year. These installations added 562,200 kilowatts of installed capacity during the year.

Gross revenues increased $8,926,141 or 17.14 percent over the previous year, for a total of $60,992,623. After provision for all costs of operation, including maintenance charges, interest and depreciation expense, and miscellaneous charges, net revenues for the year amounted to $5,949,412. During fiscal year 1956, no deferral was made for interest and depreciation expense on plant allocated to downstream river regulation. Deferral of these expenses, as was done in fiscal year 1955, would have added approximately $2 million to net revenues.

Table I presents a combined statement of revenues and expenses for the system. The data are prepared from commercial cost accounts kept in accordance with the Federal Power Commission system of accounts prescribed for electric utilities.

Summary of Revenue

Table II summarizes by customer categories the source of revenues by fiscal years to and including 1956. The aluminum industry accounted for 32.96 percent of the revenue dollar for fiscal year 1956, while industries other than aluminum accounted for 13.42 percent, making a total of 46.38 percent of the gross revenues for the year provided by industrial customers.

Sales to publicly owned utilities were 31.98 percent of the total and privately owned utilities 19.67 percent. Other operating revenues amounted to 1.97 percent.

Increased sales occurred in all categories. Sales to aluminum industries increased $3,188,522, other industries $1,365,024, publicly owned utilities $1,904,096, and privately owned utilities $2,073,325.

Repayment of Federal Investment

The gross Federal investment in the power portion of all the generating projects in operation and in related transmission facilities comprises the total of all funds appropriated and requisitioned for construction and operations, together with indirect items such as WPA expenditures and amounts transferred from other Federal agencies, plus interest at 2½ percent on the unrepaid balance.

As of June 30, 1956, this investment amounted to $1,569,975,868, as shown in table IV. This includes accumulated interest in the amount of $195,600,457. A summary of the interest accumulation is shown in table III.

With the exception of the amounts transferred to the continuing fund, all receipts from power sales and miscellaneous sources allocated to power are deposited in the Treasury to repay the Federal investment.

As of June 30, 1956, repayments total $449,689,085, leaving an unpaid balance of $1,120,286,783. Of the total repaid, $247,513,025 represents payment of all current expenses since inception of the program; the remaining amount of $202,176,060 is repayment on the capital investment of $1,322,462,843 as shown in table IV.

Inasmuch as no increase in the basic $17.50 kilowatt-year rate will be made prior to December 1957, additional generation scheduled for future years, while increasing gross revenues, will reflect lower net revenue due to higher interest and depreciation expenses because of the relatively higher construction costs for the new projects.

A summary of plant accounts as of June 30, 1956, is shown in table V.

Based on individual projects the return of power capital investment has been as follows:

Project	Power capital investment [1]	Repaid as of June 30, 1956	Percent repaid	Net power investment [1]
Bonneville Power Administration	$412,098,422	$103,597,390	25.14	$308,501,032
Bonneville Dam project	59,839,067	24,662,894	41.22	35,176,173
Columbia Basin project	207,000,732	51,972,069	25.11	155,028,663
Hungry Horse project	87,502,575	4,783,408	5.47	82,719,167
Albeni Falls project	30,549,336	641,001	2.10	29,908,335
McNary Dam project	272,972,262	12,843,739	4.71	260,128,523
Detroit-Big Cliff project	41,905,270	2,044,687	4.88	39,860,583
Lookout Point-Dexter project	41,542,590	1,053,352	2.54	40,489,238
Chief Joseph project	131,848,105	455,850	.35	131,392,255
Chandler project	3,494,519	121,670	3.48	3,372,849
Total	1,288,752,878	202,176,060	15.68	1,086,576,818

[1] Exclusive of unexpended funds in U. S. Treasury.

Foregoing data on repayment of the investment are based on cost accounts maintained in accordance with the Federal Power Commission uniform system of accounts.

TABLE I.—*Columbia River power system—condensed summary of revenues and expenses—operating projects only*

	Fiscal year 1955 [1]	Fiscal year 1956 [2]	Total to June 30, 1956 [3]
Operating revenues	$52,066,482	$60,992,623	$462,805,892
Expenses of operation, maintenance, etc	13,101,399	14,865,090	123,335,770
Provision for depreciation	14,516,958	18,539,972	101,347,677
Interest expense	15,937,409	21,691,302	137,702 338
Miscellaneous deductions, etc	(80,589)	(53,153)	1,674,500
Total deductions	43,475,177	55,043,211	364,060,285
Accumulated net revenues from operations	8,591,305	5,949,412	98,745,607

[1] These figures provide for deferral of interest expense in the amount $1,673,330 and depreciation expense of $366,949 on plant allocated to downstream river regulation.

[2] These figures do not provide for any deferral of interest and depreciation expense on plant allocated to downstream river regulation.

[3] These figures include the writeoff of the accumulated deferred interest and depreciation expense to June 30, 1955, on plant allocated to downstream river regulation as follows:

Interest expense	$15,039,591
Depreciation	2,348,204
Total	17,387,795

TABLE II.—*Revenue by class of customers through fiscal year 1956*

Class of customer	1951 and prior	1952	1953	1954	1955	1956	Total to June 30, 1956	1956 percentage (dollar revenue)
Industry:								
Aluminum	$101,072,840	$13,376,207	$13,545,562	$15,944,356	$16,909,588	$20,098,110	$180,946,663	32.96
Other [1]	24,890,143	4,650,425	4,715,747	5,417,177	6,821,850	8,186,874	54,682,216	13.42
Publicly owned utilities	38,969,757	12,973,025	13,882,890	14,882,997	17,601,135	19,505,231	117,815,035	31.98
Privately owned utilities	54,744,490	8,526,775	6,239,276	7,882,879	9,926,150	11,999,475	99,319,045	19.67
Other operating revenue	5,396.509	653,714	791,734	1,190,284	807,759	1,202,933	10,042,933	1.97
Total operating revenue	225,073,739	40,180,146	39,175,209	45,317,693	52,066,482	60,992,623	462,805,892	100.00

[1] Includes sales to Federal agencies.

TABLE III.—*Columbia River power system—summary of interest on Federal investment as of June 30, 1956*

Interest during construction, to be returned during repayment period as part of the Federal investment:		
Transmission system	$6, 138, 823	
Bonneville Dam project	2, 333, 547	
Columbia Basin project	9, 687, 397	
Hungry Horse project	4, 708, 543	
McNary Dam project	19, 449, 222	
Albeni Falls project	1, 025, 874	
Detroit-Big Cliff project	2, 683, 524	
Lookout Point-Dexter project	3, 052, 036	
Chief Joseph project	8, 694, 344	
Chandler project	124, 808	
Subtotal		$57, 898, 118
Interest charged to operations:		
Transmission system	43, 227, 304	
Bonneville Dam project	19, 956, 839	
Columbia Basin project	52, 752, 518	
Hungry Horse project	7, 061, 125	
McNary Dam project	8, 415, 796	
Albeni Falls project	1, 435, 690	
Detroit-Big Cliff project	2, 651, 538	
Lookout Point-Dexter project	1, 352, 499	
Chief Joseph project	817, 737	
Chandler project	31, 293	
Subtotal		137, 702, 339
Gross interest accumulation		195. 600, 457

TABLE IV.—*Columbia River power system—summary of Federal investment in operating power projects and repayment as of June 30, 1956*

	Gross investment	Repayments	Net investment
Investment in current expenses:			
Operation, maintenance, etc	$109, 810, 687	$109, 810, 687	
Interest [1]	137, 702, 338	137, 702, 338	
Total current expenses	247, 513, 025	247, 513, 025	
Investment in capital assets:			
Electric plant investment [2]	1, 288, 752, 878		
Unexpended appropriations	33, 709, 965		
Total capital investment	1, 322, 462, 843	202, 176, 060	$1, 120, 286. 783
Total Federal investment	1, 569, 975, 868	449, 689, 085	1, 120, 286, 783

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[1] The Columbia River power system does not receive appropriations for payment of interest, but imputes and includes in its accounts provisions for interest expense and returns receipts to the Treasury in repayment of such expenses.

[2] Includes interest during construction of $57,898,118, which will be repaid to the Treasury as part of capital cost of electric plant.

TABLE V.—*Columbia River power system—summary of plant accounts in operating projects as of June 30, 1956*

Project	Total	Allocation	
		Nonpower	Power
Bonneville Power Administration	$397, 494, 532		$397, 494, 532
Bonneville Dam project	86, 946, 718	$27, 320, 612	59, 626, 106
Columbia Basin project	496, 501, 499	292, 033, 152	204, 468, 347
Hungry Horse project	107, 529, 495	20, 662, 037	86, 867, 458
Albeni Falls project	30, 947, 946	298, 685	30, 649, 261
McNary Dam project	301, 537, 202	25, 814, 420	275, 722, 782
Detroit-Big Cliff project	66, 193, 692	24, 455, 594	41, 738, 098
Lookout Point-Dexter project	92, 753, 321	51, 176, 604	41, 576, 717
Chief Joseph Dam project	135, 911, 164	261, 435	135, 649, 729
Chandler project	12, 456, 924	8, 960, 904	3, 496, 020
Total plant	1, 728, 272, 493	450, 983, 443	1, 277, 289, 050
Less: Combined reserve for depreciation			94, 236, 032
Total less reserve			1, 183, 053, 018

SUMMARY OF OPERATIONS

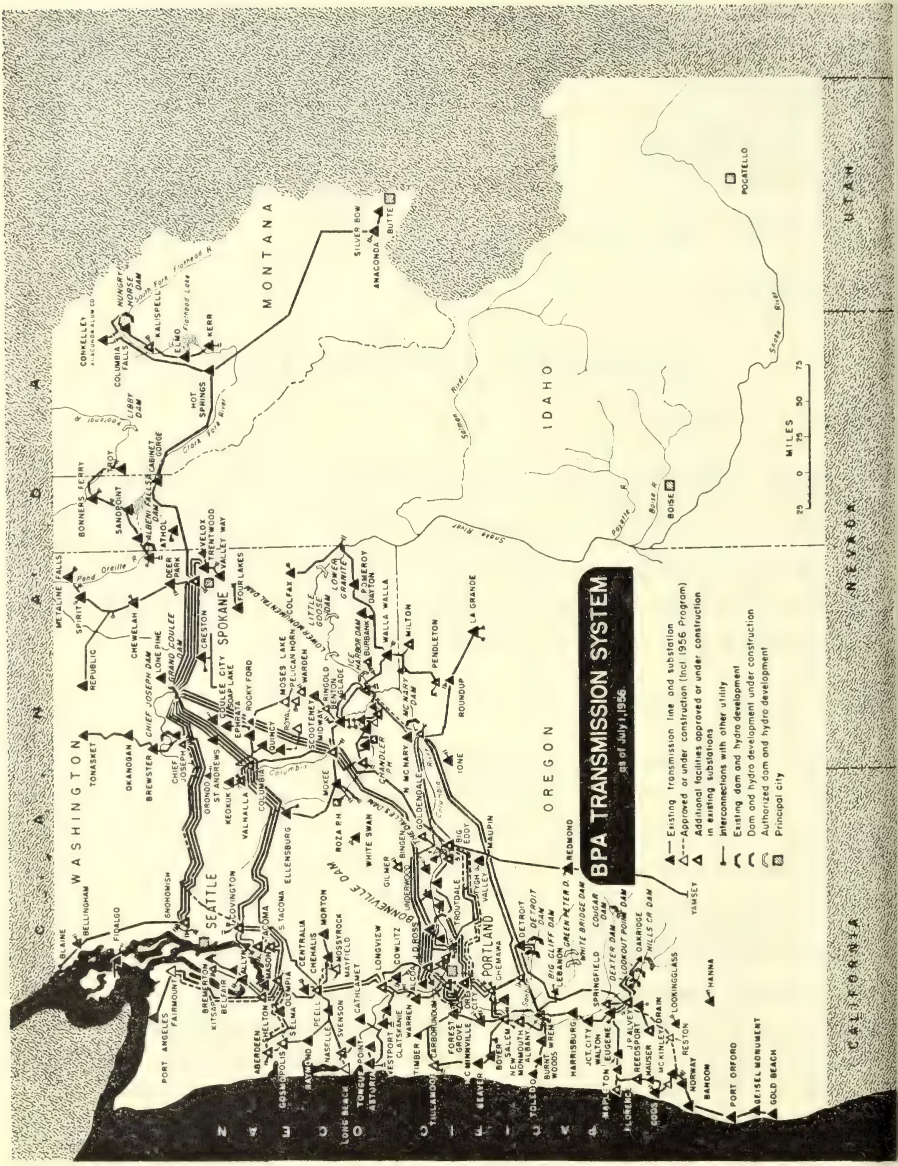
Energy Production

Energy generated at 11 Federal plants for the Administration totaled 27.6 billion kilowatt-hours during fiscal year 1956. This was an increase of 18.7 percent over fiscal year 1955. Two new plants, Chief Joseph and Chandler, were connected to the system during the year. In addition, four new units at McNary and the third unit at Albeni Falls were brought into production during the year.

New System Peak

A new system peak was established during the 8–9 a. m. hour on February 1, 1956, before the Chandler units and the 11th and 12th units at McNary were in operation. Maximum coincident demand on the 10 Federal plants was 4,479,000 kilowatts, an increase of 22.7 percent over the previous fiscal year's maximum demand of 3,651,000 kilowatts occurring during December 1954.

Except for four isolated quarters, maximum system demands have continuously exceeded nameplate rating of installed generators since the fall of 1946. Energy produced at Federal plants for the Administration is shown by years in table VI and illustrated in the accompanying chart. Prepared on a quarterly basis, the chart shows the general trends of the Bonneville Power Administration's system-load growth.


BPA TRANSMISSION SYSTEM
as of July 1, 1956
▲— Existing transmission line and substation
△--- Approved or under construction (Incl. 1956 Program)
▲ Additional facilities approved or under construction in existing substations
Interconnections with other utility
Existing dam and hydro development
Dam and hydro development under construction
Authorized dam and hydro development
Principal city
MILES
25 0 25 50 75
C A N A D A
WASHINGTON
MONTANA
IDAHO
OREGON
CALIFORNIA
NEVADA
UTAH
PACIFIC OCEAN
SEATTLE
SPOKANE
PORTLAND
TACOMA
BOISE
BUTTE
POCATELLO
GRAND COULEE DAM
CHIEF JOSEPH DAM
BONNEVILLE DAM
MC NARY DAM
HUNGRY HORSE DAM
LIBBY DAM
ALBENI FALLS DAM
DETROIT DAM
LOOKOUT POINT DAM
ICE HARBOR DAM
LOWER MONUMENTAL DAM
LITTLE GOOSE DAM
LOWER GRANITE
THE DALLES DAM
Columbia River
Snake River
Salmon River
Clark Fork River
Pend Oreille R.
Boise R.
Payette R.
Flathead Lake
South Fork, Flathead R.
Kootenai R.

Receipts and Deliveries

Bonneville Power Administration's transmission grid forms the backbone of the interconnected transmission system of public and private utilities in the Pacific Northwest. As a result, electric energy receipts and deliveries on Bonneville's transmission system cover many complex transactions in addition to receipts from Federal powerplants and deliveries by sales.

The integrated transmission grid makes possible the fullest utilization of power facilities in the area through diversity in peaking and water capabilities and diversity of system-load conditions. Substantial quantities of energy are received and delivered as transfers from other utilities.

Transactions also involve storage by the Administration in non-Federal reservoirs as well as storage by non-Federal utilities in the Grand Coulee Reservoir. Disposition of energy includes deliveries from storage in Grand Coulee or to storage in other reservoirs, energy transfers for the Bureau of Reclamation from Grand Coulee, energy used by the Administration, and energy losses in transmission and transformation.

Table VII, electric energy account, summarizes energy receipts and deliveries for fiscal year 1956.

Sale of 26 Billion Kilowatt-Hours

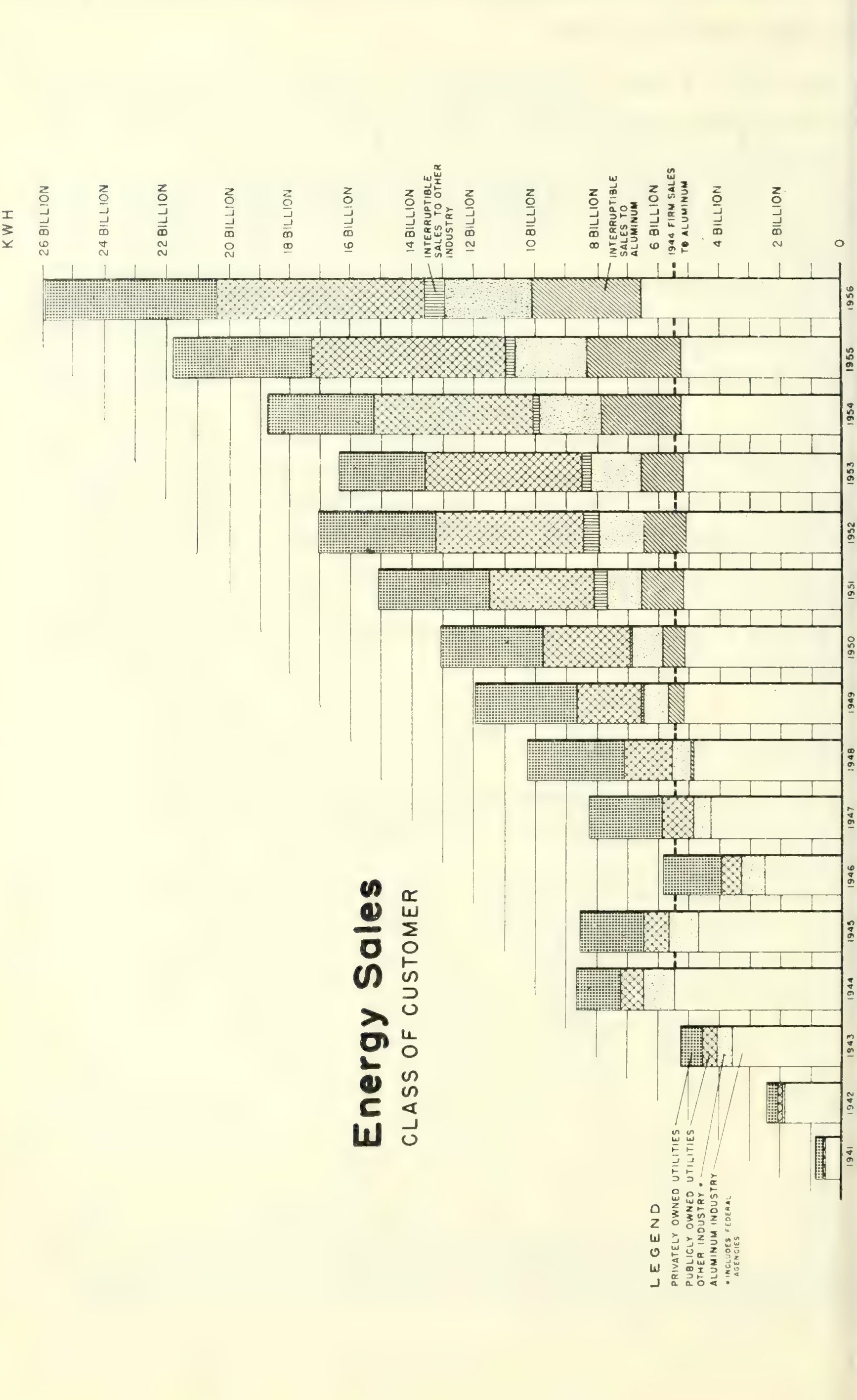
Energy sales to customers of the Bonneville Power Administration totaled 26 billion kilowatt-hours during the fiscal year 1956, an increase of 19 percent over 1955.

Sales of electric energy to other utilities, both publicly and privately owned, totaled 12.4 billion kilowatt-hours, an increase of 14.4 percent. Deliveries to industrial plants and Federal agencies totaled 13.6 billion kilowatt-hours, an increase of 23.6 percent over the 1955 fiscal year.

With favorable water conditions during the year, the Administration delivered 4.1 billion kilowatt-hours of interruptible energy to industrial plants, an increase of 22.2 percent over the previous year.

Composite Average Rate of 2.38 Mills

The Administration has sold 190.4 billion kilowatt-hours of electric energy at a composite average rate of 2.38 mills per kilowatt-hour during the 18 years of operation ended June 30, 1956. Sales to publicly owned utilities for the 18 years were 42 billion kilowatt-hours at an average of 2.81 mills. Privately owned utilities received 43 billion kilowatt-hours at an average of 2.30 mills, and industries 105.4 billion kilowatt-hours at 2.24 mills per kilowatt-hour.

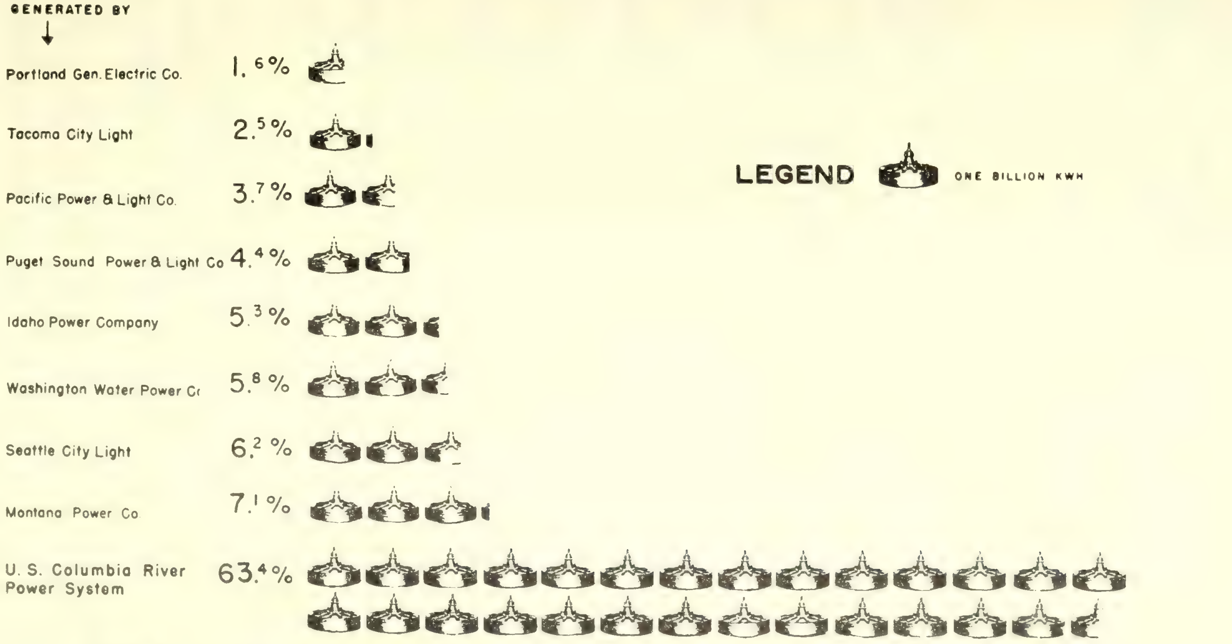


Energy Sales

CLASS OF CUSTOMER

Power Generated BY THE PRINCIPAL ELECTRIC UTILITIES OF THE PACIFIC NORTHWEST

YEAR ENDED JUNE 30, 1966



TOTAL 49.0 BILLION KWH

SOURCE: WEEKLY OPERATING REPORTS OF N. W. POWER POOL

THE ABOVE UTILITIES ARE MEMBERS OF THE NORTHWEST POWER POOL. UTAH POWER & LIGHT CO. AND BRITISH COLUMBIA ELECTRIC CO. ARE ALSO POOL MEMBERS BUT ARE NOT INCLUDED IN THIS CHART BECAUSE THEIR MAJOR SERVICE AREAS LIE OUTSIDE THE PACIFIC NORTHWEST REGION.

Power sales to aluminum plants were 85.1 billion kilowatt-hours at an average of 2.13 mills. These plants characteristically take power at very high load factors, approaching 100 percent, which results in the exceptionally low average cost on the Administration's C and A rate schedules. Sales to industries other than aluminum, including sales to Federal agencies, were 20.3 billion kilowatt-hours at an average of 2.68 mills.

Sales by classes of customers are shown in table VIII.

Rate Schedules

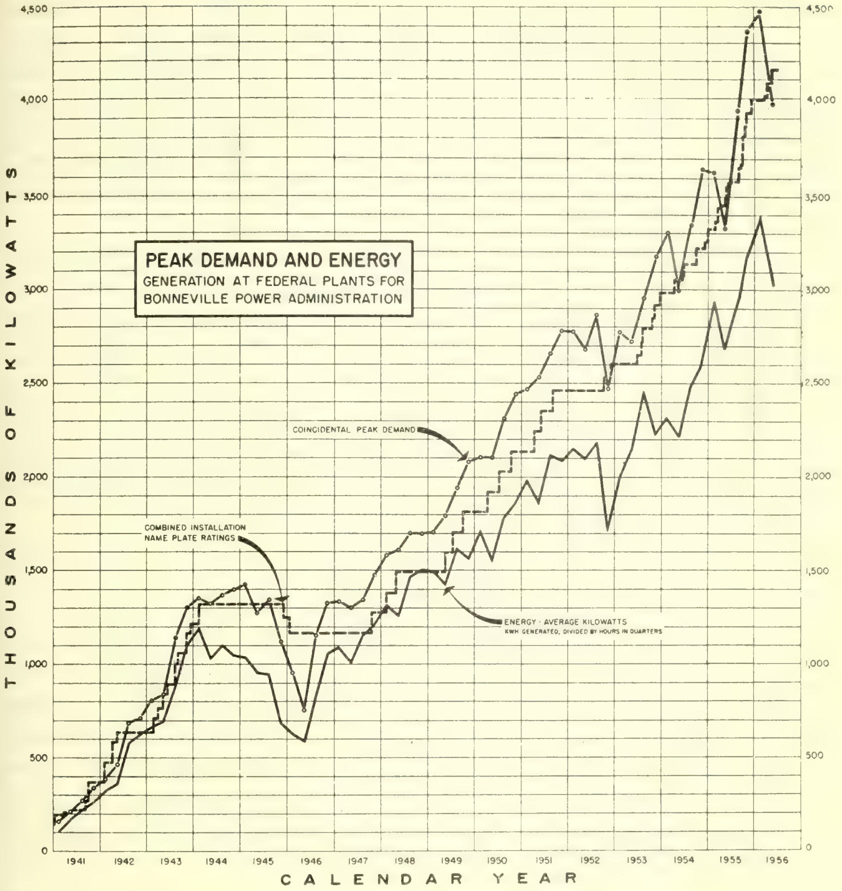
Almost three-quarters of the energy sales were made under the C–4 wholesale rate schedule at an average rate of 2.15 mills per kilowatt-hour. This is the kilowatt-year rate for firm power delivered anywhere from the transmission system, and is also used with special measured demand provisions for sales of interruptible power. Sales are generally made under this rate to industries operating at high load factor and to utilities having substantial generating facilities. Other sales were made principally under the E schedule to utilities purchasing all or substantially all of their power requirements from the Administration. At-site power is sold under the A–4 rate. Sales under the F schedule were made to the utilities and industries requiring power at low-load factor use, and under the H schedule for dump, exchange, or experimental purposes. A summary of energy sales for the fiscal year 1955 classified by rate schedules is shown in table IX.

In addition to the usual review of wholesale rates by the regular staff of the Bonneville Power Administration, a special review of the Administration's rate structure by the Ford, Bacon & Davis Co. was completed during the 1956 fiscal year. Study of this report by the Administration's staff, BPA customers and interested agencies continued throughout the fiscal year.

Customers Served

The Administration was serving 114 customers at the end of fiscal year 1956. There were 76 publicly owned distributors of power, 18 industrial customers, 11 Federal agencies, and 9 privately owned utilities.

Service was discontinued to six customers during the year: One Federal agency—Pasco Engineer Depot, and five publicly owned utilities—Chelan County Cooperative, Molson-Chesaw Electric Cooperative, Pend Oreille Electric Cooperative, Sandy Electric Cooperative, and Stevens County PUD. The loss of these customers does not represent a loss in load, since service was assumed by other customers of the Administration.



Generation Added

Additions to the United States Columbia River power system in fiscal year 1956 have a nameplate rating of 562,200 kilowatts. The last unit of 14,200 kilowatts capacity was installed at Albeni Falls project on the Pend Oreille River. Four additional units with a total capacity of 280,000 kilowatts were installed at McNary project, and the first four units with a total capacity of 256,000 kilowatts were installed at Chief Joseph project. The Corps of Engineers is construction agency for all three of these projects. The Bureau of Reclamation installed all units with total capacity of 12,000 kilowatts at the Chandler plant on the Yakima River.

Projects Summarized

Projects existing, under construction, and authorized for construction by the Corps of Engineers and Bureau of Reclamation are shown in table X. The existing projects, including the units to be installed during fiscal year 1957, will provide 3,056,000 kilowatts of prime power when operated as a system. With completion of the projects under construction prime capability will be 4,030,000 kilowatts and with completion of the authorized projects prime capability will be approximately 6 million kilowatts. The authorized prime capability has been reduced by the presently scheduled non-Federal construction of Priest Rapids project.

Existing storage capacity usable for power in Federal reservoirs is 9,868,000 acre-feet. An additional 437,000 acre-feet will be provided by Cougar and Hills Creek on which construction is under way, and 5,332,000 acre-feet would be provided by Libby and Green Peter projects which are authorized for construction.

All generation and storage capacity under Federal construction will be in service by December 1961 under the present schedule. Service dates for the other authorized projects are not scheduled as no funds have been appropriated for their construction.

Non-Federal Additions

Non-Federal generating capacity in the area served by the Administration was increased in fiscal year 1956 by initial operation of the last three units at the Box Canyon plant of Pend Oreille PUD. These three units have a nameplate rating of 45,000 kilowatts. In addition, Timothy Meadows Reservoir was completed on the Clackamas River by Portland General Electric Co. to add 10,500 kilowatts of prime power at the company's downstream plants. Future additions licensed for construction by non-Federal utilities in this area are shown in table XI. These additions represent an increase of 2,100,000 kilowatts of nameplate rating over projects in a comparable status 1 year previously.

Northwest Power Pool

Generation during fiscal year 1956 by the principal electric utility systems of the Pacific Northwest is shown in table XII. All of these utilities are members of the Northwest power pool. The Utah Power & Light Co. and the British Columbia Electric Co. are also members of the pool but are not included as their major service areas are outside the region.

A total of 63.4 percent of the energy generated by major utilities of the region was produced by the United States Columbia River power system. In addition to power requirements of nonpool utilities and major industries served through the Administration's transmission system, 7.2 billion kilowatt-hours of energy were provided to other pool utilities for meeting their requirements.

Transmission System Additions

During the fiscal year the Bonneville Power Administration grid was increased to 7,195 circuit miles of transmission lines and to 8,008,750 kilovolt-amperes of transformer capacity. This total includes 231 circuit miles of 287,000-volt lines, 4,054 circuit miles of 230,000-volt lines, 2,679 circuit miles of 115,000-volt lines, and 231 miles of lower voltage line.

A total of four new substations was added to the system and the substation transformer capacity was increased by 681,300 kilovolt-amperes. With these additions the Administration's system includes 178 substations. Static capacitors with a capacity of 68,550 reactive kilovolt-amperes were installed, bringing the total on the system to 1,736,695 kilovolt-amperes.

Several major transmission lines were completed to bring the increased generation of Federal power dams under construction into the transmission grid and to the load centers. The McNary Dam-Vancouver line was extended into Vancouver, Wash., in October 1955. The voltage of this line will be increased to 345,000 volts in the fall of 1956. A second 230,000-volt line was energized in December 1955, between McNary Dam and the Willamette Valley in western Oregon. This required additional erection of 152 miles of steel tower line.

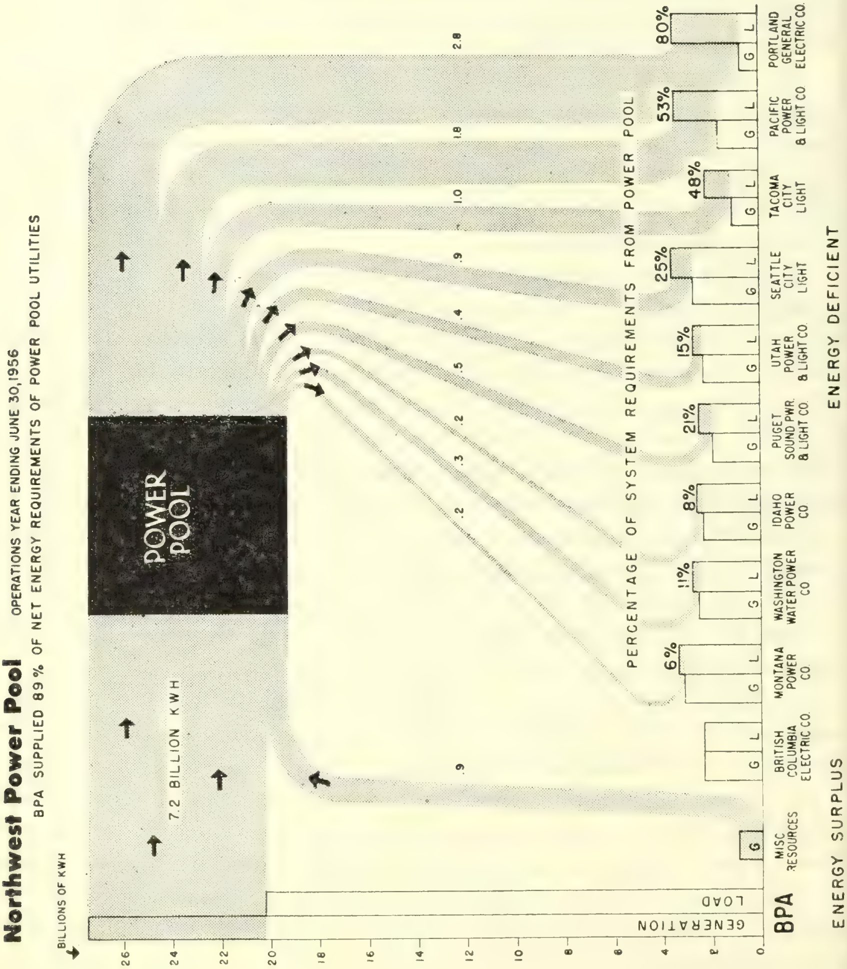
Grand Coulee-Snohomish lines 1 and 2 were looped into the Chief Joseph Dam in August 1955 to transmit the initial generation of this plant. In March a 133-mile, 345,000-volt line was completed and energized at 230,000 volts between Chief Joseph Dam and Snohomish, Wash., in the Puget Sound area.

A 115,000-volt tap line to the Midway-Franklin line was built and energized in January 1956 to bring the generation of the Chandler Dam into the Bonneville Power Administration system.

Four new substations, ranging in capacity from 1,000 to 20,000 kilovolt-amperes, were energized during the fiscal year. Transformer capacity by the addition of transformers, or forced cooling ranging from 6,000 to 250,000 kilovolt-amperes, was increased at 16 stations. Four static capacitor installations of 68,550 kilovolt-amperes reactive were made.

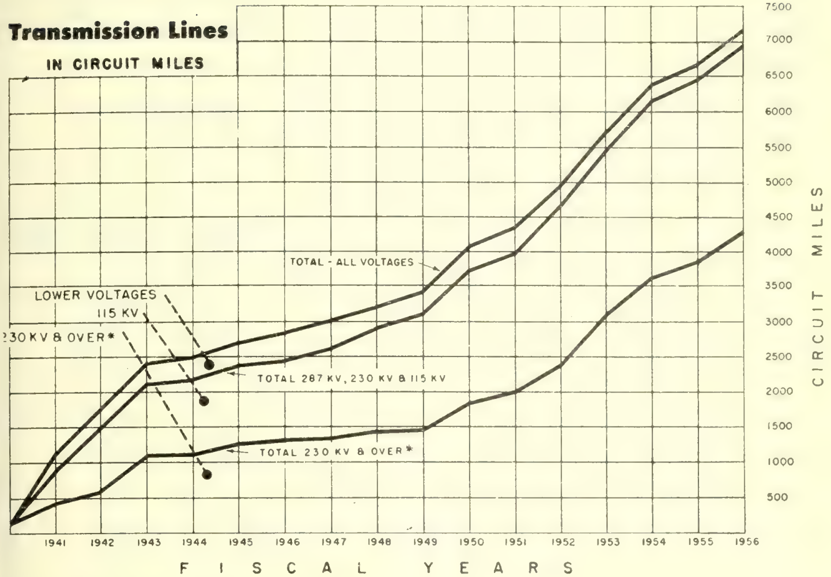
New Construction

Major construction concentration during the fiscal year continued on the second 345,000-volt line between Chief Joseph Dam and Covington in the Puget Sound area, a 230,000-volt line between McNary Dam and Franklin, Wash., in the Columbia Basin area, and a 230,000-volt line between The Dalles Dam and Chemawa, Oreg., in the northern Willamette Valley. Additional 230,000-volt transmission facilities are being extended from the Alvey, Oreg., substation to Fairview,



Northwest Power Pool OPERATIONS YEAR ENDING JUNE 30,1956

BPA SUPPLIED 89% OF NET ENERGY REQUIREMENTS OF POWER POOL UTILITIES

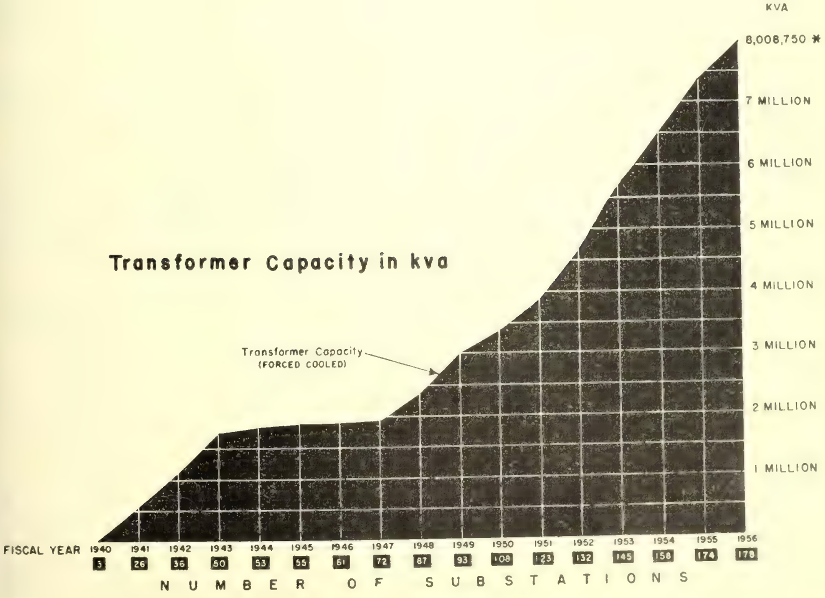


Transmission Lines

IN CIRCUIT MILES

*INCLUDES 231 MILES 287 KV

Note: VOLTAGES SHOWN ARE OPERATING VOLTAGES



Transformer Capacity in kva

* INCLUDES 400,000 KVA OF AUTOTRANSFORMERS OPERATED AS PART OF TRANSMISSION LINES

Oreg., in the southwest Oregon coast area, and 115,000-volt facilities from Olympia, Wash., to Fairmount and Aberdeen in the Olympic Peninsula area.

TABLE VI.—*Generation at Federal plants for the Bonneville Power Administration, fiscal years 1939–56*

BY FISCAL YEARS

Fiscal years ending June 30	Generation (thousands of kilowatt-hours)	Maximum demand (kilowatts)	Load factor (percent)
1939–41	1, 144, 932	210, 000	
1942	2, 549, 153	468, 000	62. 2
1943	5, 618, 436	841, 000	76. 3
1944	9, 239, 823	1, 355, 000	77. 6
1945	9, 051, 573	1, 427, 000	72. 4
1946	6, 236, 163	1, 346, 000	52. 9
1947	8, 753, 737	1, 335, 000	74. 9
1948	10, 885, 907	1, 610, 000	77. 0
1949	12, 925, 788	1, 797, 000	82. 1
1950	14, 140, 834	2, 106, 000	76. 7
1951	16, 472, 384	2, 535, 000	74. 2
1952	18, 555, 401	2, 784, 000	75. 9
1953	17, 633, 232	2, 867, 000	70. 2
1954	20, 195, 833	3, 301, 000	69. 8
1955	23, 253, 186	3, 651, 000	72. 7
1956	27, 599, 380	4, 479, 000	70. 1
Total	204, 255, 762	4, 479, 000	

BY PLANTS

	Generation (millions of kilowatt-hours)		Date connected to system [1]	Operating agency
	Fiscal year 1956	Total to July 1, 1956		
Albeni Falls	237	258	Mar. 25, 1955	Army Engineers.
Bonneville	4, 303	56, 075	July 1, 1938	Do.
Chandler	26	26	Feb. 13, 1956	Do.
Chief Joseph	1, 914	1, 914	Aug. 22, 1955	Do.
Detroit [2]	445	1, 238	July 1, 1953	Do.
Big Cliff	105	206	June 12, 1954	Do.
Grand Coulee [3]	13, 266	130, 884	Mar. 22, 1941	USBR.
Hungry Horse	1, 205	2, 970	Oct. 29, 1952	USBR.
Lookout Point [2]	436	621	Dec. 16, 1954	Army Engineers.
Dexter	88	96	June 7, 1955	Do.
McNary	5, 574	9, 968	Nov. 6, 1953	Do.
Total	27, 599	204, 256		

[1] Date of commercial operations.
[2] Excludes energy for condenser power at Detroit and Lookout Point.
[3] Includes energy transferred for Bureau of Reclamation.

TABLE VII.—*Electric energy account for fiscal year 1956*

Energy received (millions of kilowatt-hours):	
Energy generated at Federal plants for BPA [1]	27, 599
Power purchased and interchanged in	3, 454
Total received	31, 053

See footnote at end of table

Energy delivered (millions of kilowatt-hours):	
Sales	25, 976
Power interchanged out	3, 237
Used by Administration	29
Total delivered	29, 242
Energy losses in transmission and transformation	1, 811
Losses as percent of total energy received—percent	5. 8
Maximum demand on generating plants (kilowatts), Feb. 1, 1956, 8–9 a. m., Pacific standard time	4, 479, 000
Load factor, total generated for BPA—percent	70. 1

[1] For detail by plants, see table VI.

TABLE VIII.—*Electric energy sales by class of customer, fiscal years 1939–56*

[Millions of kilowatt-hours]

Fiscal years ending June 30	Aluminum	Other industries [1]	Publicly owned utilities	Privately owned utilities	Total
1939–41	523	5	35	537	1, 100
1942	1, 845	79	143	358	2, 425
1943	3, 589	507	435	739	5, 270
1944	5, 454	1, 022	728	1, 467	8, 671
1945	4, 667	965	824	2, 057	8, 513
1946	2, 492	800	636	1, 903	5, 831
1947	4, 212	627	1, 045	2, 378	8, 262
1948	4, 902	647	1, 561	3, 181	10, 291
1949	5, 666	881	2, 081	3, 342	11, 970
1950	5, 863	1, 024	2, 840	3, 312	13, 039
1951	6, 545	1, 538	3, 414	3, 579	15, 076
1952	6, 472	1, 943	4, 803	3, 794	17, 012
1953	6, 547	1, 947	5, 110	2, 791	16, 395
1954	7, 862	2, 254	5, 127	3, 531	18, 774
1955	8, 352	2, 624	6, 274	4, 578	21, 828
1956	10, 141	3, 422	6, 909	5, 502	25, 974
Total to July 1, 1956	85, 132	20, 285	41, 965	43, 049	190, 431

[1] Includes Federal agencies.

TABLE IX.—*Electric energy sales by rate schedules during fiscal year 1956*

Rate schedule	Energy (thousands of kilowatt-hours)	Revenue	Mills per kilowatt-hour
C–4:			
Industries	12, 152, 389	$25, 503, 711	2. 10
Utilities	7, 026, 985	15, 659, 415	2. 23
Subtotal	19, 179, 374	41, 163, 126	2. 15
F–4:			
Industries	23, 078	98, 634	4. 27
Utilities	153, 585	603, 426	3. 93
Subtotal	176, 663	702, 060	3. 97
A–4:			
Industries	896, 988	1, 541, 580	1. 72
Utilities	11, 589	40, 600	3. 50
Subtotal	908, 577	1, 582, 180	1. 74
E–4: Utilities [1]	4, 065, 206	12, 679, 874	3. 12
Experimental, H–3 and exchange: Industries and utilities	1, 643, 907	4, 109 767	2. 50
Total	25, 973, 727	60, 237, 007	2. 32

[1] Including Federal agency pumping loads.

TABLE X.—*General specifications—projects existing, under construction and authorized*

	Location	Stream	Plant installations		Nominal prime power (kilowatts)[2]	Pool elevation (feet)	Usable storage (acre-feet)[4]	Average head (feet)	Initial date in service	Principal purpose[5]
			Number of units	Total capacity (kilowatts)[1]						
Existing projects:										
Bonneville	Washington-Oregon	Columbia	10	518, 400	458, 000	72		59	June 1938	P, N.
Grand Coulee	Washington	Columbia	18	1, 944, 000	1, 631, 000	1, 288	5, 072, 000	326	September 1941.	P. I, FC, N.
Hungry Horse	Montana	South Fork Flathead	4	285, 000	187, 000	3, 560	2, 982, 000	364	October 1952	P, I, FC, N.
Detroit	Oregon	North Santiam	2	100, 000	29, 000	1, 564	323, 000	299	July 1953	P, I, FC, N.
McNary	Washington-Oregon	Columbia	14	980, 000	548, 000	340		78	November 1953.	P, I, N.
Big Cliff	Oregon	North Santiam	1	18, 000	10, 000	1, 206		91	June 1954	P.
Lookout Point	Oregon	Middle Fork Willamette.	3	120, 000	36, 000	926	336, 000	185	December 1954.	P, I, FC, N.
Albeni Falls	Idaho	Pend Oreille	3	42, 600	29, 000	2, 062	1, 155, 000	24	March 1955	P, FC, N.
Dexter	Oregon	Middle Fork Willamette.	1	15, 000	12, 000	695		53	June 1955	P.
Chief Joseph	Washington	Columbia	16	1, 024, 000	815, 000	946		169	August 1955	P. I.
Chandler	Washington	Yakima	2	12, 000	11, 000	620		118	February 1956	P, I.
Total				5, 059, 000	3, 766, 000		9, 868, 000			
Projects under construction:										
The Dalles	Washington-Oregon	Columbia	16	1, 119, 000	651, 000	160		87	April 1957	P, N.
Roza	Washington	Yakima	1	11, 250	6, 000	1, 221		140	March 1958	P, I.
Cougar	Oregon	South Fork McKenzie.	2	25, 000	14, 000	1, 690	188, 000	418	November 1960.	P, I, FC, N.
Hills Creek	Oregon	Middle Fork Willamette.	2	30, 000	14, 000	1, 543	249, 000	210	November 1961.	P, I, FC, N.
Ice Harbor	Washington	Snake	3	270, 000	137, 000	440		97	December 1961.	P, I, N.
Total				1, 455, 250	822, 000		437, 000			

Authorized projects:										
Libby	Montana	Kootenai	6	516, 000	264, 000	2, 459	5, 010, 000	267		P, FC, N.
Lower Monumental	Washington	Snake	3	270, 000	130, 000	533		92		P, I, N.
Little Goose	Washington	Snake	3	270, 000	139, 000	633		99		P, N.
Lower Granite	Washington	Snake	3	225, 000	114, 000	715		80		P, N.
John Day	Washington-Oregon	Columbia	13	1, 105, 000	725, 000	262		101		P, I, FC, N.
Green Peter	Oregon	Middle Santiam	2	81, 000	22, 000	984	322, 000	315		P, I, FC, N.
White Bridge	Oregon	Middle Santiam	1	15, 000	9, 000	670		93		P.
Total				2, 482, 000	1, 403, 000 [3] −28, 000		5, 332, 000			
Total, 23 projects				8, 996, 250	5, 963, 000		15, 637, 000			

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[1] Nameplate rating.

[2] Average capability in a coordinated system during an 8-month storage release period (September 1936 through April 1937).

[3] Pumping requirements of 28,000 average kilowatts for 450,000 acres of the Columbia Basin project.

[4] Storage usable for power production.

[5] P—Power; I—Irrigation; FC—Flood Control; N—Navigation.

TABLE XI.—*Non-Federal utilities generator installation schedule, August 1, 1956*

Utility and plant	Stream	Unit No.	Nameplate rating (thousands of kilowatts)	Date in service
City of Seattle:				
Ross	Skagit	4	90	January 1957.
Gorge (reconstruction of diversion dam).	do		(1)	December 1958.
Puget Sound Power & Light Co.:				
Snoqualmie Falls No. 2	Snoqualmie	2	20	April 1957.
Upper Baker	Baker	1 and 2	85	September 1959.
Lower Baker (addition)	do	3	55	September 1960.
Portland General Electric Co.: Pelton.	Deschutes	1	36	December 1957.
		2	36	January 1958.
		3	36	March 1958.
City of Tacoma:				
Mayfield	Cowlitz	1	40	January 1959.
		2, 3, and 4	120	October 1959.
Mossyrock	do	1	75	October 1961.
		2	75	January 1962.
		3	75	April 1962.
		4	75	July 1962.
Washington Water Power Co.: Noxon Rapids.	Clark Fork	1	84	September 1959.
		2	84	December 1959.
		3	84	March 1960.
		4	84	June 1960.
Grant County PUD:				
Priest Rapids	Columbia	1–8	630	September 1960.[2]
Wanapum	do	1–8	570	September 1962.[2]
Chelan County PUD: Rocky Reach.	do	1 and 2	180	September 1961.
		3–7	450	September 1962.

[1] Will increase head by 100 feet and peaking capability by 57,000 kilowatts.

[2] Date of river closure after installation of units.

TABLE XII.—*Generation by the principal electric utility systems of the Pacific Northwest, fiscal year 1956* [1]

Utilities	Kilowatt-hours (billion)	Percent of total generation
Publicly owned:		
Bonneville Power Administration	27.5	63.4
Seattle City Light	2.7	6.2
Tacoma City Light	1.1	2.5
Total publicly owned	31.3	72.1
Privately owned:		
Puget Sound Power & Light Co	1.9	4.4
Washington Water Power Co	2.5	5.8
Pacific Power & Light Co	1.6	3.7
Portland General Electric Co	.7	1.6
Montana Power Co	3.1	7.1
Idaho Power Co	2.3	5.3
Total privately owned	12.1	27.9
Total generation	43.4	100.0

[1] Generation shown is for the members of the Northwest power pool. Utah Power & Light Co. and British Columbia Electric Co. are not included because their service areas lie outside the Pacific Northwest region.

SOUTHWESTERN POWER ADMINISTRATION

Douglas G. Wright, *Administrator*

FOR THE fiscal year 1956, Southwestern Power Administration received $1,250,000 in direct appropriations for its operation and maintenance program, and authorization by the Congress making available $6 million out of receipts, for all costs in connection with the purchase of power and energy, and rentals for the use of transmission facilities. Additional funds in the amount of $1,200,000 remained available for completion of the Administration's construction program.

POWER RESOURCES

The installed and dependable capacity in the hydroelectric and steam plants in the integrated system as of June 30, 1956, is shown in the following table:

Project or plant	River basin	Capacity	
		Installed	Dependable
Hydroelectric:			
Interconnected System:		*Kilowatts*	*Kilowatts*
Bull Shoals	White	160,000	130,000
Denison	Red	70,000	60,000
Fort Gibson	Grand	45,000	48,000
Norfork	White	70,000	63,000
Tenkiller Ferry	Illinois	34,000	30,000
Subtotal		379,000	331,000
Isolated plants:			
Blakely Mountain [1]	Ouachita (Red)	75,000	75,000
Narrows	Little Missouri	17,000	17,000
Whitney	Brazos	30,000	28,000
Subtotal		122,000	120,000
Total, hydroelectric		501,000	451,000
team: [2]			
Western Farmers Electric Cooperative		30,000	30,000
Central Electric Power Cooperative		15,000	16,000
N. W. Electric Power Cooperative		40,000	42,000
Total steam		85,000	88,000
Grand total		586,000	539,000

[1] In commercial operation October 1, 1955.

[2] Contracts with G & T Cooperatives reactivated July 1955.

This hydroelectric capacity of 501,000 kilowatts will be increase by 100,000 kilowatts when Table Rock project on the White Rive comes into production, which is presently scheduled for early 1959.

ENERGY PRODUCTION

Hydroelectric Projects

The adverse water conditions which have existed in the SPA are since May 1952 were partially alleviated during the period Januar 1955 through June 1955. However, during the fiscal year 1956 strea flow conditions have been near normal only for the Narrows, Whitney and Blakely Mountain projects. The reservoir system, up throug June 30, 1956, has experienced below median flow for approximatel 40 months of the past 4 years.

Project	Percent of median flo	
	July 1952 to July 1955	July 1955 to July 195
	Percent	*Percent*
Bull Shoals	69	[illegible]
Denison	94	[illegible]
Fort Gibson	35	[illegible]
Norfork	68	[illegible]
Tenkiller Ferry	76	[illegible]
Narrows	100	[illegible]
Whitney		[illegible]
Total	65	[illegible]

Stream flow conditions during June 1956 were above normal an pool levels, with the exception of the Denison project, are only slightl below normal. During the past year some secondary energy wa generated at Denison. The total net generation for the year for th interconnected system was equal to the annual primary energy fo the previous critical period. It is expected that normal operation will be continued during the coming year with a reasonable expectation of considerable secondary energy being available.

The annual primary energy and net generation for each project i given in the table below. During the 1956 fiscal year the total ne generation of hydroelectric energy is shown to have amounted t 938,140,240 kilowatt-hours, of which 802,261,700 kilowatt-hours wer from the interconnected system. Blakely Mountain project, on th Ouachita River near Hot Springs, Ark., went into commercial operation October 1, 1955.

Project	Annual primary energy [1] (kilowatt-hours)	Fiscal year 1956 net generation (kilowatt-hours)
Interconnected System Operation:		
Bull Shoals	414,400,000	386,641,000
Denison	140,000,000	196,989,000
Fort Gibson	[2] 78,800,000	74,756,900
Norfork	116,000,000	105,510,000
Tenkiller Ferry	[2] 51,300,000	38,364,800
Subtotal	800,500,000	802,261,700
Isolated plants:		
Narrows	18,400,000	21,158,540
Whitney	33,200,000	48,588,000
Blakely Mountain [3]	122,000,000	66,132,000
Subtotal	173,600,000	135,878,540
Total	974,100,000	938,140,240

[1] Former critical period.
[2] Data from Corps of Engineers cost allocation report 1955.
[3] In commercial operation October 1, 1955.

Steam Plants

The contracts with the G and T Cooperatives, deactivated July 1953, were reactivated with some changes in July 1955. The amounts of energy generated by these plants for marketing during fiscal year 1956 are shown in the following table:

Plant	Net generation
	Kilowatt-hours
Western Farmers Electric Cooperative (Anadarko, Okla.)	200,778,228
Central Electric Power Cooperative (Chamois, Mo.)	125,698,227
N. W. Electric Power Cooperative (Missouri City, Mo.)	274,913,000
Total	601,389,455

MARKETING

During the fiscal year 1956 billing periods, the Southwestern Power Administration had available for sale a total of 1,594 million kilowatt-hours of energy, of which 713.4 million kilowatt-hours represented purchases or withdrawals[1] and 880.6 million kilowatt hours represented hydroelectric generation. Of the total of 1,492.6 million kilowatt-hours marketed, after losses, 1,429.4 million kilowatt-hours represented primary and firm energy, while 63.2 million kilowatt-hours represented secondary energy. Energy deliveries to preferred customers amounted to 1,079.3 million kilowatt-hours or 122.6 percent of the total hydroelectric energy available for sale and 67.7 percent of the total energy available for sale. At the end of the firscal year, the Arkansas Power & Light Co. was entitled to 217.7 million kilowatt-hours under the Aluminum contract, the purchase and delivery of which was deferred in fiscal year 1955, and the delivery of energy purchased by the Oklahoma utility companies, still deferred, amounted to 3.1 million kilowatt-hours.

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[1] Represents generation adjusted to billing periods, without Blakely Mountain contract withdrawals, which are shown under purchases or withdrawals.

Service under the Arkansas Power & Light Co.—Blakely Mountain contract—began on October 1, 1955. Generation at this project under the contract amounted to 63.7 million kilowatt-hours. The Government withdrew 85.6 million kilowatt-hours, 21.9 million kilowatt-hours in excess of generation, from the Arkansas Power & Light system for delivery by the Government to other customers.

Revenue from sales by SPA during the fiscal year billing periods amounted to $8,183,030. This amount included sales to preferred customers of $5,980,015, and sales to private utility companies of $2,203,015.

By the end of the fiscal year, wholesale power and energy generated by the hydroelectric facilities under the marketing jurisdiction of SPA were being sold to 16 distribution cooperatives, 21 municipalities, 5 private utilities, 5 military installations, and 7 generation and transmission cooperatives.

Power and energy deliveries to preferred customers were made directly over SPA lines through the facilities of the Texas Power & Light Co., the Southwestern Gas & Electric Co., the Public Service Co. of Oklahoma, the Oklahoma Gas & Electric Co., the Central Electric Power Cooperative, the Western Farmers Electric Cooperative, the M & A Electric Power Cooperative, the N. W. Electric Power Cooperative, Inc., and the KAMO Electric Cooperative, Inc.

CONTRACTING

Contract negotiations began with five generation and transmission cooperatives in Missouri and Oklahoma to amend the lease option and power sales agreements between the cooperatives and the Government, which were rendered inoperative in July 1953. The primary considerations in the negotiations are: Deletion of the Government's option to purchase; addition of provisions for balancing off accounts; addition of provisions for operation and maintenance of the cooperatives' transmission system by the cooperatives; and addition of a provision whereby each of the cooperatives, except the N. W. Electric Power Cooperative, Inc., has an option to assume amortization, and operation and maintenance financial requirements of its 69 kilovolt transmission system. As an interim measure, pending conclusion of these negotiations, and at the direction of the Congress, the agreements which were rendered inoperative in July 1953, were reactivated on July 15, 1955, with the exception of that with the Sho-Me Power Corp. with which a temporary substitute agreement was executed to be effective for 1 year from July 1, 1956, to June 30, 1957. It is expected that the negotiations with the generation and transmission cooperatives will be completed in fiscal year 1957.

Negotiations with the cities of Fulton and Eldorado Springs, Mo., and Bentonville, Ark., were initiated during the fiscal year, to provide service to them under standard power sales agreements. The negotiations with the city of Eldorado Springs have also included consideration for the wheeling of power by the Government for service to the city for a period of approximately 2 years until the Table Rock project is placed in commercial operation.

Negotiations were also initiated with the city of Springfield, Mo., for the purchase of excess energy from the city when available, and needed by the Government. The negotiations with Springfield also included consideration for the wheeling of power by the Government for service to Springfield. Negotiations with the city of Carthage, Mo., were initiated on a standard power sales agreement to include a provision for purchase of excess energy when available, and when needed, by the Government, from the city's thermal generating plant.

Negotiations initiated with rural electric cooperatives during the fiscal year included those with the Kay Electric Cooperative of Blackwell, Okla., with service to begin after the Table Rock project is placed in commercial operation, and with the Central Missouri Electric Cooperative of Sedalia, Mo.

During the year a contract was executed and service initiated to one new preferred customer, the city of Paris, Ark., for 1,200 kilowatts, and contracts were amended providing for increases in contract demand and contract obligation of 66,880 kilowatts. The increases in contract demand consisted of 1,300 kilowatts to distribution cooperatives and 3,480 kilowatts to municipalities. Contract obligations were increased by 62,100 kilowatts to the generation and transmission cooperatives. Contracts were also amended to provide for 105 new or reactivated points of delivery for existing preferred customers and to abandon 14 delivery points.

At the end of fiscal year 1956, the sum of the power commitments to all preferred customers served by SPA amounted to 291,540 kilowatts, and were comprised of the following:

	Kilowatts
Rural electric distribution cooperatives	34, 570
G and T Cooperatives	213, 650
Military installations	9, 900
Municipalities	33, 420

RATES

During the fiscal year, a repayment and average rate determination study was made, based on the 1954 Corps of Engineers cost allocations to power and the costs of the Southwestern Power Administration. As a result, a revised rate schedule was proposed which provided a substantial increase over the existing rate schedule "A." The filing of this revised rate schedule with the Federal Power Commission was delayed at the request of the chairmen of the House and Senate Committees on Interior and Insular Affairs and on Public Works.

LABOR MANAGEMENT COOPERATION

Negotiations were conducted with the International Brotherhood of Electrical Workers, Local Union 1002, as representatives of hourly employees of the Administration, which resulted in a general agreement for the promotion of the common interests and the establishment and maintenance of labor-management cooperation between SPA and its hourly employees. This general agreement became effective October 10, 1955.

FEDERAL CIVIL DEFENSE ACTIVITIES

Under the provisions of Departmental Order 2751, Southwestern Power Administration continued its liaison work and coordination of civil-defense activities among the departmental bureaus and with the Federal Civil Defense Administration until April 6, 1956. At that time SPA was relieved of this responsibility and the Director, Bureau of Indian Affairs, Muskogee, Okla., who is chairman of the Southwest field committee, was designated as departmental defense liaison officer for FCDA Region 5. Thereafter, SPA's civil-defense coordinator worked closely with the newly appointed Federal civil-defense liaison officer in making capabilities of this bureau available for civil-defense purposes.

Federal Civil Defense Administration Delegation No. 4 delegated to the Secretary of the Interior the responsibility to:

> Plan a national program, provide technical guidance to the States and direct Federal activities concerned with the emergency restoration of electric utility service to attacked areas and provision of adequate electric utility service to support areas.

Under this delegation, the Secretary appointed the executive director of the operating committee of the interconnected systems, Southwest area, as director, Defense Electric Power Area No. 12, to administer the Secretary's authority under the delegation within this electric power area.

This Administration as participant of the interconnected systems, Southwest area, has assisted in perfecting the Department's procedures under this delegation for aid and assistance among the companies during disasters or other emergencies, and for the use of manpower, equipment, and material for restoration of service in the area. SPA will continue to be governed in matters of electric power for civil defense by the director, Defense Electric Power Area No. 12.

SOUTHWEST FIELD COMMITTEE

During fiscal year 1956, as in the past, Southwestern Power Administration has actively participated in the programs and activities of the Southwest field committee.

The committee, under new chairmanship this year, has been advised of our continued participation and our interest as an agency in water compact negotiations, development of watersheds approved for planning under P. L. 566, and all other matters pertaining to the conservation and development of natural resources.

ARKANSAS-WHITE-RED BASINS INTERAGENCY COMMITTEE

Upon completion of its assigned task in June 1955, the Arkansas-White-Red Basins Interagency Committee was reorganized by action of the Interagency Committee on Water Resources, in accordance with the expressed desire of the Federal agencies and States concerned.

The participation of this agency, for the past 5 years, in the studies conducted to complete this comprehensive framework plan for the development of the natural resources in the Arkansas, White, and Red River Basins has proved conclusively that the liaison, coordination, and personal contacts were invaluable in carrying out the functions of this Administration's part in the development, conservation, and utilization of the natural resources of the Southwest.

The Department of Interior is the chairman agency for fiscal year 1957, and this Administration is continuing its participation in and representation on this committee with a view toward achieving the ultimate goal of a reduction of flood losses; irrigation of new lands and supplemental water supply; drainage of land for agricultural purposes; additional hydroelectric power facilities; storage facilities for municipal and industrial water supply; improved navigation facilities; and other benefits to be derived from the development and conservation of natural resources in the Southwest.

LITIGATION

In *Kansas City Power & Light Company et al.* v. *McKay* (substituted) *et al.*, the District Court of the District of Columbia upheld the validity of numerous complicated contracts between Southwestern Power Administration and various rural electric cooperatives in Missouri. The plaintiffs appealed from the final judgment entered in the case. Thereafter, the Court of Appeals, District of Columbia Circuit, vacated the judgment and remanded the case to the District Court with directions to dismiss the complaint. The plaintiffs then applied for a writ of certiorari which was denied by the Supreme Court of the United States, thus ending the case.

In *Kansas City Power & Light Company*, *et al.* v. *N. W. Electric Power Cooperative, Inc., and Douglas G. Wright, Administrator of Southwestern Power Administration* (Docket No. 12,095, before the Public Service Commission of Missouri), six privately owned electric utility companies sought to require the cooperative to obtain a certificate of convenience and necessity for construction and operation of a thermal generating plant and transmission system in Missouri, and to require the Administrator of SPA to comply with the rules and regulations of the Commission with respect to the sale and transmission of electric power and energy in Missouri. Counsel for the Administrator of SPA appeared specially before the Commission on March 23, 1951, and moved for dismissal of the proceeding on jurisdictional grounds. Thereafter, counsel for the cooperative appeared specially and moved for dismissal on similar grounds. Briefs of the defendants and complainants were subsequently filed. Upon motion by complainants, an order of the Commission was entered, dismissing the case without prejudice, June 21, 1956.

SOUTHEASTERN POWER ADMINISTRATION

Chas. W. Leavy, *Administrator*

THE hydroelectric output marketed by the Southeastern Power Administration in fiscal year 1956 consisted of 1,041,400 kilowatts of capacity and 2,247,121,601 kilowatt-hours of energy. It was sold to 4 public bodies, 32 rural electric cooperatives, 1 Federal agency, and 5 privately owned utilities. The sales earned $11,444,558.33, an increase of $1,661,453.52 over earnings of the previous year, and brought revenues earned in all years to a total of $43,172,260.96.

The output was generated at seven Corps of Engineers projects. They were the Wolf Creek, Dale Hollow, and Center Hill projects in Kentucky and Tennessee, the Allatoona project in Georgia, the Clark Hill project in Georgia and South Carolina, the John H. Kerr project in Virginia and North Carolina, and the Philpott project in Virginia. The installed generating capacity of 1,031,000 kilowatts at these projects at the beginning of the fiscal year was not increased during the year. Construction by the Corps continued on four other projects (Jim Woodruff in Georgia and Florida, Buford in Georgia, and Old Hickory and Cheatham in Tennessee) that are to have an installed capacity totaling 252,000 kilowatts and was begun on two additional projects (Hartwell in Georgia and South Carolina and Fort Gaines in Georgia and Alabama) that are to have an installed capacity totaling 328,000 kilowatts.

The combined output of Wolf Creek, Center Hill, and Dale Hollow was sold to the Tennessee Valley Authority under a long-term contract. All power generated at Allatoona was sold under a long-term contract to the Georgia Power Co. All of the Philpott output was sold to Appalachian Electric Power Co. under temporary arrangements pending the conclusion of negotiations for long-term sales. Part of the Clark Hill output was sold under long-term contracts to two public bodies in South Carolina, and part of the Kerr project's output was sold under long-term contracts to the Virginia Electric and Power Co. and to 17 rural electric cooperatives in Virginia and North Carolina. The remainder of the Clark Hill and Kerr output was sold on a temporary basis for a portion of the year pending the making of long-term arrangements which were completed or in the process of completion at the end of the fiscal year. At the end of the fiscal year the remainder of the output of the Kerr project was being sold under contracts executed during the fiscal year with Carolina Power and Light Co. and 16 preferred agencies in South Carolina. The one-half of the output of the Clark Hill project to be marketed in Georgia will be marketed under a contract executed on May 16, 1956, with Georgia Power Co. and contracts with 77 preferred customers in Georgia which were executed or in the process of negotiation at the close of the fiscal year.

Applications which had been made for Federal Power Commission approval of rates for the sale of power from the Clark Hill project, the Kerr project (sold pursuant to the Carolina Power and Light Co. contract) and the Cumberland projects were pending at the close of the fiscal year.

The Congress appropriated $244,000 for headquarters operation and maintenance, and $1,160,000 for the purchase of firming energy and the payment of wheeling fees. Southeastern's working force numbered 33 employees at the beginning of the fiscal year and 34 employees when the year ended.

DEFENSE ELECTRIC POWER FUNCTIONS

THE Assistant Secretary—Water and Power Development—also exercises direct supervision over activities in the field of defense electric power. The administration of electric power functions is vested in the Secretary of the Interior under the Defense Production Act, Executive Order, and delegations from Office of Defense Mobilization and Federal Civil Defense Administration.

Activities in the defense electric power field are concerned with assuring an adequate power supply for the Nation under partial and full mobilization conditions. These activities include, among others: assembling and evaluating data as to the production capacity of electric utilities and the supplying of electric power under mobilization conditions; serving as an allotting agency to the electric power industry for the power expansion program to serve Atomic Energy Commission installations; recommending establishment or modification of expansion goals; screening and making recommendations to the Office of Defense Mobilization on requests for accelerated tax amortization for electric power facilities under expansion goals established by the Office of Defense Mobilization; and conducting various activities concerned with departmental and electric power functions in the event of a national emergency to assure continuity of supply of essential electric power. Brief summaries of progress in these functional areas are herewith presented.

December peak capabilities, peak loads, and gross reserves (percent of loads) as actually occurred in 1954 and 1955, and as forecast for the years 1956 through 1959, on the basis of median hydro conditions, are shown for the country as a whole in tabulation below.

Year	December capabilities (millions of kilowatts)	December peak loads (millions of kilowatts)	Reserves (percent of loads)
954 actual	103. 4	85. 7	20. 6
955 actual	116. 3	98. 1	18. 6
956 estimated	123. 6	105. 8	16. 8
957 estimated	132. 1	114. 1	15. 9
958 estimated	145. 7	122. 3	19. 2
959 estimated	154. 2	130. 6	18. 1

The actual peak load for 1955 and those estimated for the years 1956 through 1958 are higher than previously reported. These revisions of estimated peak loads coupled with lowered estimates of capabilities in 1956 and 1957 result in substantially lower gross reserves than previously forecast for the years 1956 through 1958. Reserves are estimated to fall below 15 percent in Federal Power Commission Regions I, III, and VII during the years 1956 and 1957, and in Regions I and VII during the years 1958 and 1959. Reserves in these and other regions may be somewhat lower especially during 1956 and 1957, and to some extent in 1958, if the work stoppage in a major equipment manufacturer's plant is not ended soon. A general work stoppage began October 16, 1955, and ended 156 days later on March 16, 1956, throughout most of the works but is still continuing in its turbine shop where the larger sized turbines have been manufactured. Furthermore, the 1956 steel strike will adversely affect capabilities and hence reserves although presently its effect is undetermined.

The Office of the Assistant Secretary—Water and Power Development—is the allotting agency of the program which provides allotments and priority assistance on materials and equipment for construction of certain facilities to furnish interim, firm, and backup power to Atomic Energy Commission installations. Since the program started in 1953, facilities with a total capacity of 10,136,000 kilowatts have been placed in service by June 30, 1956. The final unit was scheduled to be in service during April of this year. However, the work stoppage in a major equipment manufacturer's plant has delayed the installation of the last three units with 585,000 kilowatts of capacity. Latest indications are that the last unit can be in operation some 7 months after termination of the turbine shop strike.

Due to closing of the goal no applications were eligible for consideration after December 31, 1955, on expansion goal 55 (electric power), which was revised and issued on August 26, 1952, and amended and enlarged on April 15, 1955, to 150 million kilowatts to be installed by the end of 1958. Expansion goal 225, for power facilities for military, atomic energy, and defense-related needs, was established March 17, 1955.

Through December 31, 1955, under the original and amended expansion goal 55, and through June 30, 1956, under expansion goal 225, applications for certificates of necessity for rapid tax amortization have been received for 1,215 electric utility projects and 43 industrial plants. Of these, 965 utility plants and 39 industrial powerplants were recommended for issuance. The certificates of necessity issued by ODM are related to an increase in the Nation's electric power capacity of 34,856,055 kilowatts by electric utility systems and 777,000 kilowatts by industrial powerplants.

A study chaired by this Department with representatives from other Government departments participating is under way to evaluate the power situation in a major defense area in the event of an attack. Similar studies of other critical areas will be undertaken.

New criteria for rating electric power facilities such as generating plants, transmission lines, and substations have been formulated jointly by representatives from this and other Government departments. These new criteria have been recommended to and accepted by the Industry Evaluation Board for use in reviewing the ratings of electric power facilities nationwide.

A study of the wartime supply requirements for the electric power industry has been made. This study involved the determination of the industry's consumption during full mobilization years by shape and form of aluminum, copper, and steel for construction of projects, and for maintenance, repair, and operating supplies—commonly known as M. R. O. requirements.

The Defense Electric Power Staff has participated with the Office of Defense Mobilization and Federal Civil Defense Administration in the development of plans for action by Government and industry in the event of full mobilization or of enemy attack, and is proceeding to implement approved readiness policies and programs. Planning for steps to be taken in event of a national emergency is being carried on in order to assure a continuation of essential electric power supply. Conferences have been held throughout the Nation with electric power industry officials in connection with the establishment of area offices and the appointment of area power administrators who will function in case of an attack.

OFFICE OF SALINE WATER

David S. Jenkins, *Director*

IN RECENT YEARS shortages of fresh water in many parts of the nation and throughout the world have emphasized the extreme importance of conserving this natural resource and of developing entirely new sources to serve the growing populations, industries and agriculture. Therefore, it is clear that the many saline underground and surface waters of our inland areas, and the ocean waters at our shores must now be counted among our natural resources and put to increasing uses within the next 1 or 2 decades.

The Congress recognized these needs and the potential sources of additional fresh water, and in 1952 authorized a program of research and development of improved processes for converting saline waters to fresh water. In June 1955 the program was extended and enlarged by amendments to the act of 1952, and during the past year the activity was accelerated within the Department in accordance with the amendment.

The conversion program supplements and is by no means a substitute for the program now underway for conservation of the existing water supplies. The objective is primarily one of reducing the cost of the water produced by development of new methods or improvement of known processes. Results of this research to date are encouraging.

Several distillation processes have been investigated during the past 12 months, particularly vapor compression and multiple effect distillation. Fabrication of a Badger-Hickman vapor compression prototype unit having design capacity of 25,000 gallons per day is about 50 percent complete, and will be field-tested next year. Meanwhile a private industrial firm is developing a small Hickman still. Additional research on distillation carried out during the year involved forced circulation and dropwise condensation, separation at high temperature and pressure, and comparative cost analyses of several distillation cycles. The latter study, conducted by Mr. W. L. Badger, pointed out the theoretical potentials of combinations of distillation equipment, provided scale-free operation can be obtained. One method proposed by Mr. Badger which appears attractive is use of a large number of multiple-effect evaporators heated by exhaust steam from a powerplant. As a result of the increased interest in this field, several industrial firms also have been devoting considerable effort to examining the potentialities of large-scale multiple-effect systems. A great deal of experimental work will be necessary to substantiate the theoretical advantages of the various systems.

Research on solar distillation was carried out by Dr. George O. G. Löf, Denver, Colo., Dr. Maria Telkes, New York University, and Bjorksten Research Laboratories with the primary objectives of reducing the investment costs, improving materials, increasing efficiencies, and developing a multiple effect cycle. Considerable progress has been made on all four objectives. Cooperation on solar distillation was continued with a European working party.

Work during the year indicated the need of improved membranes for all processes utilizing membrane separations, e. g., electrodialysis, reverse osmosis or osmotically-driven cells. Consequently, fundamental research investigations aimed at improving the selectivity and other characteristics of these membranes were carried on by the National Bureau of Standards and Polytechnic Institute of Brooklyn.

Two field tests on the Ionics, Inc., membrane demineralizer were completed during the year. Successful operation was obtained, but conversion costs are higher than predicted from laboratory data. Research and testing of this unit is being continued at the Bureau of Reclamation Laboratories in Denver. Informal cooperation, including exchange of results, was continued with the T. N. O. Netherlands cooperative project on electrodialysis which is making excellent progress on an improved unit. Two American firms have developed improved membranes.

Laboratory results have demonstrated that an osmotically-powered cell (osmionic process) developed by Dr. G. W. Murphy of State University of New York, can demineralize brackish waters. Southern Research Institute is now engaged in design, construction, and testing of a practical unit.

Work at the University of Florida on reverse osmosis was continued and includes a fundamental investigation of the causes of reverse osmosis and mechanism of flow through such membranes.

Various phases of freezing as a means to convert saline waters were investigated. The Applied Science Laboratories obtained basic data on ice crystal formation and phase separation, the University of Washington tested commercial types of freezers on sea water, and Battelle Memorial Institute is evaluating a zone-purification process.

The investigation of solvent extraction as a means of demineralization was continued by Texas A. & M. Research Foundation. Results have shown that the process is technically feasible, but to become economically attractive, improved solvents must be developed.

The Office of Salines Water, with assistance from several of its consultants, developed and published a standardized procedure for making preliminary cost estimates of saline water conversion.

Results to date from the saline water conversion program have been encouraging and gradual progress toward low-cost production of converted water is being made. As a result of the stimulation given to the subject by the saline water program, scientific interest in the problem is increasing. The present and contemplated rate of conversion research and development, sharply accelerated from time to time when the laboratory results justify, should produce a number of economically feasible processes in 5 to 15 years. With the increasing emphasis on conservation of existing supplies, and in the absence of an emergency, this result appears timely and sufficient.

During the coming year, both fundamental and applied research on the problem will be continued and accelerated, with emphasis on larger pilot plants and new approaches.

Office of the Assistant Secretary

Mineral Resources

Felix Edgar Wormser, *Assistant Secretary*

THE Assistant Secretary for Mineral Resources discharges the responsibilities of the Secretary of the Interior with respect to the Department's programs in the field of the development and utilization of minerals and metals, including mineral fuels. He exercises supervision over the Geological Survey, the Bureau of Mines, the Defense Minerals Exploration Administration, the Office of Oil and Gas, the Office of Minerals Mobilization, and the Division of Geography.

The Assistant Secretary serves as the principal spokesman for the Department of the Interior in the field of mineral affairs at the policymaking level within the Federal Government. He participates in meetings of the Council on Foreign Economic Policy as the Department's liaison representative, and sits frequently with the Defense Mobilization Board as problems involving minerals and fuels are considered.

The office coordinates the Department's representation on the interdepartmental advisory committees that the Department of Commerce utilizes in carrying out its responsibilities under the Export Control Act of 1949. Requiring particular attention in this area during the year were problems with respect to iron and steel scrap, copper, aluminum, nickel, and selenium.

In addition to the foregoing responsibilities, the Office of the Assistant Secretary, Mineral Resources, is the principal point of contact between the Federal Government and the mineral industries. The Assistant Secretary met frequently with industry advisory committees which were established to assist the Office of Minerals Mobilization in carrying out its responsibilities in connection with mobilization problems.

The Assistant Secretary also met informally with representatives of the coal industry to discuss methods of encouraging an accelerated and coordinated program of coal research. As a result of these conferences the Bureau of Mines, in cooperation with Bituminous Coal Research, Inc., undertook a comprehensive survey of research being conducted within this field. A report published in May 1956, entitled "Outlook and Research Possibilities for Bituminous Coal," discussed work currently in progress, reviewed the economic position of the bituminous coal industry over the past several decades, and summarized the competitive forces within the energy field.

The Assistant Secretary consulted with and advised the Director of the Office of Defense Mobilization concerning the operation and effect of a plan to restrict oil imports by voluntary action upon the part of the oil industry. This program was established as a defense mobilization measure in response to a recommendation by the President's Advisory Committee on Energy Supplies and Resources Policy.

The Office of the Assistant Secretary supplied information and advice to the Director of ODM concerning the administration of the Government's long-range strategic stockpiling program. The Office also worked closely with the ODM and the Department of Agriculture in setting up criteria to govern the acquisition for a supplemental stockpile of metals and minerals by barter or by purchase with local currencies obtained from the sale abroad of agricultural commodities.

In response to recommendations made by the President's Advisory Committee on Minerals Policy, the Assistant Secretary arranged for a comprehensive review of all minerals research and development activities of the Department. Particular emphasis was placed upon an examination of those functions designed to strengthen the Nation's mineral position by promoting wise development and use of its resources. As a result action was taken to accelerate those activities which must precede or supplement private exploration such as topographic and geologic mapping, geologic research and the development of geochemical and geophysical theories and techniques. Steps also were taken to expand and intensify programs of mineral and metal research aimed at the development of latent resources, new mineral raw materials, and improved utilization of existing materials. These programs were coordinated fully with those of other scientific Federal agencies and as closely as practicable with minerals research and development activities of private industry.

The Office of the Assistant Secretary reviewed legislative proposals designed to maintain the domestic production of tungsten, asbestos, fluorspar and columbium-tantalum by extending government purchase programs initiated during the Korean emergency. Following these exhaustive case-by-case analyses the Department recommended a maximum interim program to provide a transition period during which orderly adjustment might be made to minimize economic dislocations. Following legislative approval of the program the Department received an initial appropriation of $21 million for the purchase of these materials.

The Office of the Assistant Secretary also continued to work toward the development of a longer range program to implement fully the recommendations of the President's Advisory Committee on Minerals Policy and thereby encourage the most efficient utilization and conservation of domestic mineral resources.

The Office of the Assistant Secretary aided in the preparation of the Department's report and testimony on the renewal of the Reciprocal Trade Agreements Act and the legislation authorizing the Office of Trade Cooperation. The Office of the Assistant Secretary also coordinated studies and analyses of the tariffs on several minerals and metals as a basis for developing the Department's position relative to tariff negotiations under the General Agreement on Tariffs and Trade at Geneva, Switzerland.

GEOLOGICAL SURVEY

Thomas B. Nolan, *Director*

A STRONG, prosperous America is backed by such fact-finding research agencies as the Geological Survey, responsible for seeking out new supplies and appraising known supplies of minerals and mineral fuels, classifying the public lands, mapping the surface features of the United States, and determining the quantity and quality of our Nation's life-giving water supplies.

This is a report of Survey activities during fiscal year 1956, the 77th such annual report since the Bureau was established in 1879. It shows the principal directions in which Survey scientists and engineers have shared in the task of promoting continued national economic security. It shows how the Geologic, Topographic, Water Resources, and Conservation Divisions are mobilizing for peacetime demands in the face of our expanding population. The Survey's maps, reports, and other publications arising from its scientific investigations and engineering accomplishments, form a backlog of data for future needs.

To accomplish such publications approximately 7,500 Survey employees are currently engaged in gaging streams, conducting mineral investigations, mapping, studying underground water, administering the mineral- and fuel-leasing laws, and at the same time developing new tools and methods with which to achieve improved results.

The following are summary statements of the technical divisions of the Geological Survey:

GEOLOGIC DIVISION

During fiscal year 1956 the Geologic Division continued its study of the geology of the United States and of the mineral resources of the Nation.

Survey geologists continued to provide technical data and evaluation in the programs of the Defense Minerals Exploration Administration, the Office of Minerals Mobilization, and the General Services Administration; geologic investigations of mineral resources in Latin America, Asia, and Africa were made for the International Cooperation Administration; a broad program of research in fissionable materials was continued for the Atomic Energy Commission; investigations of terrane conditions of selected areas were also continued for the Armed Forces; and, as in past years, Survey geologists served as advisers and consultants to the National Science Foundation, the Office of Defense Mobilization, and the Department of Defense.

Mineral Deposits

Systematic geologic mapping and study of active and potential mining districts was conducted in 98 projects in 29 States, to determine the geologic setting of ore deposits in the crustal framework, and the physical-chemical factors controlling their localization and distribution. Of these projects, 40 were supported by the Atomic Energy Commission, and 14 were carried out in cooperation with State agencies. In addition, 7 projects were concerned with field and laboratory studies of fundamental problems of ore genesis; 2 involved reconnaissance mapping and compilation of geologic maps of the States of Arizona and Oregon. A considerable effort went into mineral commodity studies and reviews of information on resources of various mineral commodities.

Most discoveries of new mineral resources and additions to old result from a complex sequence of ideas, events, and persons. Behind many discoveries, however, will be found the inspiration or geologic authority derived from a report of the Geological Survey, perhaps old or perhaps recently off the press. The principal value of the Geological Survey's investigations of mineral deposits, therefore, lies in the steady, long-term usefulness to the mineral industry of the geologic data and interpretations they provide. Though this vital element in discovery plays its part early in the normal train of events and is therefore relatively unspectacular, some of its results are noteworthy. Commercial exploration in the Copper Ridge area in Tennessee, for example, based in part on Geological Survey mapping and geologic interpretations, has disclosed a new and potentially major zinc-producing district. Geologic maps of the Blackbird district, Idaho, and of the Iron River district, Michigan, have been significant elements in recent discoveries that have notably increased district reserves. During the year several major mining companies have joined in an exploration program for the Tintic district, Utah, based largely on Survey mapping and studies of rock alteration. But over and above recognized applications like these, countless wellthumbed copies of Geological Survey publications in the hands of mining men and prospectors are evidence of their usefulness and influence in day-to-day exploration activities throughout the country.

Occasionally it is possible to point to a closer connection between geologic investigation and discovery. The largest physical exploration program conducted by the Geological Survey in its 77-year history was concluded in April 1956, on the Colorado Plateau. Since November 1947, a geologically guided diamond-drilling program carried out on behalf of the Atomic Energy Commission has maintained a high rate of discovery, measured in terms of the number of holes drilled. Geologic criteria and drilling techniques particularly applicable in the search for uranium deposits in sandstone have been recognized and developed by the Survey. Many of these ideas have been adopted by private industry in its ever-increasing program of exploration. For example, as an outgrowth of geologic mapping in Monument Valley, Arizona and Utah, channels were recognized as favorable sites for uranium deposits and were delineated. Subsequent geophysical tests outlined what were believed to be buried channel fillings. Diamond drilling was then undertaken in El Capitan Flat area to test the geophysical data; this drilling confirmed the interpretation of the geophysical results and discovered uranium mineralization in the channel fillings. Subsequent drilling by private industry resulted in the discovery of three significant uranium deposits.

Geologic work by the Survey in the Black Hills indicated that areas marginal to some of the larger masses of carbonate-cemented sandstones are a favorable geochemical environment for the localization of uranium deposits. To check the validity of these observations a limited experimental core-drilling program was carried out along the margin of a carbonate-cemented sandstone mapped by the Survey and an extensive uranium deposit was discovered. The deposit has not yet been fully developed but from the data now available it seems that the tonnage of mineralized rock, some of ore grade, is very large.

A program of systematic geologic mapping and minerals appraisal was continued in cooperation with the Puerto Rico Economic Development Administration.

Petroleum and Natural Gas

The Geological Survey's program of mapping and research in potential oil- and gas-producing areas is nationwide and provides background information needed in the formulation of sound exploration programs. In fiscal 1956 the Survey's program resulted in the release of 17 oil and gas maps and charts and 9 book publications relating to the majority of the petroleum-producing States. The reports completed and the projects in operation involve geologic mapping, stratigraphic reasearch both at the surface and in the subsurface, structural studies, and broad regional studies in potential oil-producing regions of 13 States.

Of particular interest because of its unusual nature was a research project started in cooperation with Scripps Institute of Oceanography to study living Foraminifera on the Continental Shelf. Variations in types and numbers of species in differing marine environments will be determined as an aid to understanding the significance of foraminiferal variations in the petroliferous Miocene rocks of California which contain similar faunas. Samples were collected during one of the research cruises of Scripps Institute, and studies of the abundant foraminifera recovered from the ocean floor are well underway.

The Survey collaborated with the West Virginia Geological Survey and several private institutions in making detailed studies of cores from a well in West Virginia, the first well in the heart of the northern Appalachian oil and gas basin that has yet penetrated the sedimentary sequence down to rocks of the basement complex. The first part of the intensive study of the core has been completed and other parts are in progress.

The Survey published the 11th edition of the map showing oil and gas fields of the United States.

Coal

During the year geologic field investigations were carried on in 10 coal-producing States including Alabama, Tennessee, Kentucky, Ohio, Pennsylvania, Arkansas, Montana, Colorado, Utah, and New Mexico, and detailed reports on 14 coal-bearing areas were published. Appraisals of coal reserves are under way in Alabama, Arkansas, Colorado, eastern Kentucky, and western Pennsylvania. A revision of the coal map of the United States was started. The series of maps thus far published on the anthracite coal of eastern Pennsylvania has provided accurate, timely data and geological interpretations for use in planning mine development and in mine-water control in more intensely mined areas.

The Survey's coal investigations included intensive study of uranium in western coals, particularly in the area of the Dakotas, Montana, and Wyoming. These studies, which have been going on for several years, have stimulated interest in the possibility of commercial production of uranium from coal, and during the past year private companies for the first time have found ore-grade uranium in

Tertiary coals in northwestern South Dakota. Studies of uranium-bearing coals are continuing in both Dakotas and in eastern Montana.

Oil Shale

A report showing the relationship of oil-bearing black shale to other rocks of the west-central part of New York State was compiled from field data; a study and report of the spore assemblage of oil-bearing Upper Devonian and Lower Mississipian rocks of Ohio was completed; and reports were prepared on the Green River oil shale in the eastern Uinta Basin, Utah. As a result of a completed study in the Piceance Creek Basin of northwestern Colorado, the amount of oil present in the oil-shale deposits of the area has been shown to be approximately double the amount previously estimated.

Engineering Geology

During the year engineering geologic investigations continued in the metropolitan areas of Seattle-Portland, Oreg.; San Francisco; Los Angeles; Denver; Knoxville, Tenn.; and Anchorage, Alaska, to provide basic geologic information pertinent to urban development. Cooperative geologic mapping programs with the States of Massachusetts and Rhode Island were continued, and a new cooperative project was started with Connecticut. The bedrock geology and the surficial geology of these States are being systematically mapped by quadrangles, and geologic information of selected sites is made available to State construction agencies as needed. Seven additional mapping projects were in progress in the States of Colorado, Montana, Nebraska, Utah, and Washington, and summary reports were completed for a group of projects in northeastern Kansas. In these areas geologic mapping, and studies of the engineering characteristics of the geologic map units, provide geologic data for regional planning and development of large-scale engineering works such as hydroelectric, irrigation, and flood control projects, and transportation routes.

Special geologic studies were made for the National Park Service and the Federal Housing Administration, to provide a basis for judging whether construction operations at proposed sites might encourage landsliding. Geologic investigations continued at the Air Force Academy site near Colorado Springs, Colo., provided detailed geologic maps and geologic advice on location of test wells, thickness of overburden, and foundation and excavation characteristics.

General Geology

Reports on the general geology and volcanology of several of the Aleutian Islands, studied in earlier years for the Department of Defense, have been completed. Studies of the surficial geology of Death Valley and the Amargosa Valley, California-Nevada, and of the volcanic and structural history of the Black Mountains, California-Nevada, were begun, to serve as background for the current economic studies of the salines in the region. Field work was completed on parts of the Snake River Plain, Idaho; Three Forks area, Montana; and northern Shoshone Range, Nevada.

Field studies continued in the Toston and Browning quadrangles, Montana; Snake River Plains and Mackay districts, Idaho; Kemmerer, and Sage quadrangles, Wyoming. In cooperation with the State of Connecticut, studies were undertaken in the area of Norwich, Conn., and in cooperation with the State of Nevada, in the Carlin and Pine Valley quadrangles, Nevada.

Scientists at the Hawaiian Volcano Observatory continued their observations of the active volcanoes there, in further efforts to comprehend the mechanism of volcanic activity. Continued studies of this kind may ultimately lead to more accurate predictions of activity.

A new multicolor geologic map of Montana, at a scale of 1 : 500,000, was published during the year.

Geophysics

Studies of the physical properties of rocks and minerals were increased, and facilities are now available for measurement of electrical resistivity, dielectric constant, magnetic susceptibility, remanent magnetization, and dynamic elastic moduli. Studies of the strength and elasticity of rocks have been started. An analog computer has been designed and built to simulate the resistance and dielectric constant of a layered earth.

As part of the program of development, testing, and modification of geophysical instruments and techniques, an experimental model of an alpha-gamma logger was successfully tested for study of radon contamination in drill holes; a scintillation core scanner and a time interval differentiator for isotope identification were also developed. A prototype model of a system of induced polarization logging has been completed for testing, and work is in progress on an acoustic logging device and a probe for determination of thermal conductivity at depths of several hundred feet in boreholes. Tests in Ohio using a sonar-type transducer placed on the ground indicate that high-frequency sonic methods may be used to determine geologic structure at shallow depths. Analysis of a vast accumulation of thermal data from northern Alaska is underway. A mathematical solution has been developed for a problem in heat conduction which will be of significance in studies of ground temperatures disturbed by bodies of water or engineering modifications of the surface, such as the erection of a heated building.

Regional geophysical surveys were expanded during the year and are now being carried on in the Colorado Plateau, in several parts of the Basin and Range Province, and in the Lake Superior region.

About 45,000 traverse miles of airborne magnetic and radioactivity surveys were flown in 14 States. In the Texas Coastal Plain a distinct and recognizable contrast in the "normal" radioactivity of adjacent formations was observed, indicating that radioactivity measurements can guide geologic mapping where formation boundaries are difficult to delineate because of poor exposures. New data on the depth and configuration of some of the sedimentary basins of Alaska have been obtained from analysis of aeromagnetic surveys in the Copper River and Bethel regions. A map of the Precambrian basement in Indiana has been prepared from analysis of the aeromagnetic survey of the State.

Geochemistry and Petrology

Chemical and spectrographic analyses, mineralogic and petrologic examinations, radioactivity and other determinations were made on approximately 46,000 samples, in support of mineral exploration and resources-evaluation programs.

Studies of the composition of cerium minerals and of all the rare-earth elements as phosphates were completed. Experimental work was begun on various proposed methods of disposal of radioactive fission-product wastes into geological environments.

Adoption of new improved techniques and instrumentation contributed to greater efficiency in service operations. The construction of a curved crystal X-ray spectrometer was completed. Application of this tool to the rapid, nondestructive analysis of substances in thin and polished sections and in extremely small samples has saved considerable laboratory time normally required for determination of various elements by conventional analytical methods. A new, quick optical test for the rare-earth minerals, adaptable to field work, was developed. A new model automatic sample changing and recording scintillation counter was modified and improved making it available for 24 hour operation. An automatic sample changer for the X-ray diffractometer was completed. It is designed to record automatically diffractometer charts for 12 samples in 16 hours, enabling the X-ray unit to be run overnight.

Investigation was completed of the ternary systems formed by the three pairs of albite, anorthite, and orthoclase with water; these studies and other studies in the system orthoclase—albite—anorthite—quartz—water—show considerable promise for application to the problem of geothermometry of feldspar-bearing rocks. The program of fundamental research on Pleistocene geochronology has resulted in a reliable sequence of radiocarbon dates for North American glacial events, and its extension to worldwide glacial correlations is well underway. Radiocarbon age determinations made on a series of deep-sea-core carbonates have allowed an extrapolation to the earliest Pleistocene climatic cycles, on the assumption of uniform sedimentation rate. Climatic cycles older than the range of the radiocarbon dating method, recorded in the oxygen isotope ratios of ocean sediments, were dated back through the entire Pleistocene epoch by assuming that the rate of deposition was the same as during the later Pleistocene. A critical study of all Larsen method (lead-alpha) age determinations to date showed that in areas of good stratigraphic and paleontologic control, zircon ages are in good agreement with the geology for about 85 percent of the rocks investigated.

Geochemical Exploration

Research in geochemical exploration has continued to provide new geochemical and geological concepts and techniques to aid in the discovery of mineral deposits. An investigation of the oxygen isotopes in limestone and related rocks near ore deposits disclosed pronounced changes in the ratios of $0^{18}/0^{16}/$ near ore deposits, suggesting the possibility of using these ratios to locate hidden ore bodies. Geobotanical and hydrogeochemical techniques for finding radioactive ore deposits were further investigated, and new, rapid, sensitive, cheap analytical methods for uranium were developed suitable for use in geochemical prospecting. These and other analytical and exploration methods developed have been made available by publication and by demonstration; methods have been adopted widely in the United States and in some 25 foreign countries by government and commercial organizations.

Paleontology and Stratigraphy

More than 45,000 fossils from 32 States, Alaska, Puerto Rico, and 14 areas outside the continental United States were examined by specialists and the resulting information incorporated in 551 administrative reports for use in guiding the field work of other geologists and for eventual inclusion in publications by them on the geology and mineral resources of numerous areas.

Research in stratigraphic paleontology contributed materially to understanding of subsurface geology of huge areas in Texas, the Williston Basin of North and South Dakota, and of Florida. Investigations of the Floridian-Bahaman carbonate province made significant contributions toward understanding the processes of limestone accumulation.

Geologic Investigations in Alaska

Reconnaissance petroleum investigations in the Lower Yukon-Koyukuk basin in western Alaska resulted in extension of known geologic units west and north from the Yukon River and collection of data for a geologic map of the Nulato and Kateel River areas. A preliminary study of petroleum possibilities was made in the Puale Bay area of the Alaska Peninsula, and field mapping was completed in the Nelchina area northeast of Anchorage.

Coal investigations continued to be largely concentrated in the railbelt. Systematic collecting of plant fossils was done in the Matanuska and the Nenana coal fields to aid in correlating the coal measures of the two fields, and subsurface exploration by power auger was begun in a critical area of the Nenana field near Healy Lake.

Mineral deposit investigations in progress included continuation of geologic mapping north of Nome to appraise the possibilities of tungsten and other minerals, a reconnaissance study in the Baird Mountains of northwestern Alaska, and preliminary examinations of several other promising areas. In southeastern Alaska systematic geologic mapping of an area northwest of Kasaan Peninsula on central Prince of Wales Island was done to appraise the mineral potential of the area. A long-term project was begun to study and map placer deposits to gain knowledge of their geologic background and to provide information useful in prospecting and exploiting such deposits. Following preliminary studies at a number of localities, detailed studies were begun late in the fiscal year in the Tofty area west of Fairbanks. Systematic use of geochemical exploration techniques as an added tool in the location of minerals in Alaska was started. To provide basic regional geologic information needed to guide in the search for mineral deposits in southeastern Alaska systematic geologic mapping of the region was begun late in the fiscal year. Results of field studies in the Lower Kuskokwim, Nutzotin Mountains, and a part of the Katmai National Monument are in a process of compilation.

Reconnaissance surveys for fissionable materials continued and a radiometric laboratory was maintained at College during the prospecting season. Detailed study was begun late in the fiscal year in the Bokan Mountain-Kendrik Bay area on southern Prince of Wales Island.

Compilation-type projects were under way on a study of Alaska metallogenic provinces and on a glacial map of the Territory. Compilation also continued on geologic quadrangle maps of the Territory at a scale of 1:250,000 utilizing existing geologic information supplemented by photogeologic study.

Reconnaissance photogeologic maps of approximately 40,000 square miles of the Territory were completed or are near completion. The geologic data contained in these maps are in large part interpreted from aerial photographs and have received only limited field checking. These reconnaissance maps are designed primarily to serve as bases for future geologic work and as interim geologic maps until more detailed studies can be made. Several large-scale photogeologic maps of mining areas in southeastern Alaska have been produced.

Military Geology

Geologic investigations on rock types, soil, vegetation and water resources were continued to provide technical advice to the Corps of Engineers, U. S. Army, and other agencies of the Armed Forces. During the year 42 comprehensive studies of foreign regions and 10 technical reports and maps were prepared by geologists, botanists, soil scientists, and other technicians in the Washington Office. In addition, numerous advisory consultations, briefings, and lectures were provided to military personnel on the military aspects of the geology in foreign, territorial, and domestic areas.

Technical assistance to the Corps of Engineers in Germany and Japan was continued. A team of specialists (geologists and soil scientists) assigned to headquarters in Heidelberg directed and instructed military technicians in the preparation of special-purpose terrain maps. A similar team in Salzburg, Austria ceased operations this year on completion of the Austrian occupation. A second team of specialists has been assigned to similar duties with the Engineers in Tokyo, Japan.

In November 1955 a geologist was assigned to accompany the Navy on Operation Deepfreeze I. Limited observations were made on the rocks in widely separated parts of Antarctica.

Field studies during the year were continued in the western Pacific and Alaska. In the Pacific a field survey of Truk was completed and work on Miyako and Ishigaki was started and brought to near completion. Military geology reports on the Palaus, Truk, Okinawa, Tinian, Guam, Yap, and Saipan were in preparation for publication. The Far East Engineer Command requested numerous engineering geology consultations, primarily on the evaluation and discovery of water resources for military use in Korea.

The program of field survey of geologic and associated terrain conditions in Alaska continued for the tenth year. Field reconnaissance was conducted in the areas of the Big Delta Military Reservation, Northeast and Southeast Copper River Basin, the Arctic Slope, and Gerstle River. Comprehensive military reports were underway on 10 areas previously investigated.

In addition to furnishing advice and studies to the Corps of Engineers, the Survey also furnished similar guidance to the Air Force on problems in the Arctic. This expansion of effort increased considerably during the year.

Foreign Geologic Investigations

Scientific and technical geologic assistance was extended to 15 countries in Latin America, Asia, and Africa under the sponsorship of the International Cooperation Administration, Department of State. Assistance in the appraisal of mineral resources was continued in Mexico, Brazil, Peru, India, Philippines, Taiwan, Egypt, Cuba, Chile, Israel, and Libya. Cooperative minerals investigations were completed in Iran. Studies in engineering geology were completed in Bolivia. Technical assistance in the field of photogeology and photogrammetry was extended to British Guiana. Long-range assistance in minerals-potential evaluation was started in cooperation with the Government of Indonesia.

Thirty-six participants from 16 countries, under the sponsorship of International Cooperation Administration, received training in the Survey's domestic field program.

A reconnaissance of Brazil's uranium resources was continued under the joint sponsorship of that government and the U. S. Atomic Energy Commission.

Gravimetric geophysical surveys were made near Camaguey, Cuba, and the gravity anomalies were drilled in search of chromite. This work, done under sponsorship of the General Services Administration, was completed during the year.

Library

The Geological Survey Library, including the branches in Denver and Menlo Park, again reached new highs in circulation and reader activity. Accessions in Washington were 24,456 text items and 3,244 maps; 13,143 pieces in Denver, and 31,349 pieces in Menlo Park. In Washington 49,461 items were loaned to Survey members for use outside the Library, 5,240 were loaned to other libraries and 3,565 were borrowed from other libraries. An estimated 125,000 items were used within the Library. About 33,000 reader visits were made, ,000 of these by non-Survey people.

The Denver Branch had about 26,000 readers, made 11,620 loans, and borrowed 1,379 items from other libraries. The Menlo Park Branch had about 3,000 readers and loaned 3,267 items.

The 1951 volume of the Bibliography of North American Geology was published during the year. At the end of the year the 1952–53 volume was in page proof, the 1954 volume and the 1940–49 cumuative volumes were at the printer, and the 1955 volume was in preparation.

CONSERVATION DIVISION

The Conservation Division classifies Federal lands as to mineral and water resources and supervises mineral-recovery operations under eases, permits, and licenses on Federal, Indian, and naval petroleum eserve lands. A small headquarters staff and a field staff of competent geologists and engineers are employed. This force makes field urveys, prepares maps and reports dealing with waterpower, fuels, minerals, and chemicals essential to the mineral-resource economy of he United States, and conducts onsite supervision of mining and drilling operations necessary to assure the safe and economical production by private enterprise of coal, oil, gas, and other minerals.

Mineral Classification Branch

From field offices in Colorado, California, Montana, New Mexico, Oklahoma, Utah, and Wyoming, geologists made specific investigations which resulted in geologic reports and maps for official use. In the interest of conservation and wise use these maps were of considerble assistance to engineers in planning and recommending to Govrnment lessees and others more efficient methods of recovery of the products involved. The Branch completed maps and reports on the eologic feasibility of seven power dam sites in Alaska; completed econnaissance of phosphate deposits, northeastern Nevada; a minral resources map of Washington; a structure contour map of the Fort Peck Indian Reservation, Montana; structure contour map of he Montana Plains; geology of dam sites, upper Columbia River, daho and Montana; a contour map of the Greenwood oil and gas eld, Kansas; a revision of the contour map of the East Orlando oil eld, Oklahoma; map of the Ragged Mountain coal district, Colorado; structure contour map of the Colorado plains; revision of the eology of the southeastern Powder River Basin, Wyoming; and a contour map on Yates sand, southeastern New Mexico.

All phases of the services rendered were maintained at a continued rapid pace throughout fiscal year 1956. In all, 28,884 cases were acted upon during the year, involving outright disposal of Federal lands with no reservation of minerals, the disposal of such lands with reservation of one or more specified minerals, or the exercise under the Federal leasing laws of the Government's right to lease for exploration by private enterprise a mineral substance from lands under its jurisdiction. In addition the Branch: prepared initial or revised definitions of 31 producing oil and gas fields containing Federal lands; appraised geologically 208 unit-plan and participating-area proposals; drafted 11 determinations of the productive limits of producing oil and gas deposits as found to exist on August 8, 194 with regard to the leaseholds involved; reported for appropriate action the fact and geologic significance of 106 new discoveries of oil or gas made on or affecting Federal-land leaseholds; recommended the competitive sale of oil and gas leases on 6 parcels of public land; reviewed and reported upon 20 appeals from decisions of the Bureau of Land Management affecting the disposal of Federal lands; and prepared 226 miscellaneous reports on the mineral potentialities of specific lands for various agencies of the Federal Government.

Water and Power Classification

Water and power classification includes investigations to determine potential waterpower possibilities. The Branch classifies public lands having value for development of waterpower projects and works closely with other bureaus and agencies in administration of the public lands so classified. These duties are carried out from a central office in Washington, D. C., and from field offices in Denver, Colo.; Sacramento, Calif.; Portland, Oreg.; and Tacoma, Wash. Investigatory work in Alaska is directed from Tacoma, Wash. Field work during 1956 was directed mainly toward obtaining basic information on the waterpower resources and storage possibilities of Federal lands in Alaska, California, Colorado, Idaho, Montana, New Mexico, Oregon and Washington. Field projects completed during the year, some of which were continued from previous years, or were in progress June 30, include surveys on Bradley Lake and Bradley River, Halibut Creek, Juneau Creek, Snow River, and Lost Lakes, Alaska; Kaweah Kern, Klamath, and North Yuba Rivers, California; Arkansas and Navajo Rivers, Colorado; Lemhi River, Idaho; Clark Fork (of the Columbia River) and Rock Creek, Montana; Navajo River, New Mexico; Coos, Nestucca, Trask, Wilson, and Deschutes Rivers Oregon; Wynoochee, South Fork Skyhomish, Wind, White, Salmon and Klickitat Rivers, and Calligan, Dorothy, and Isabel Lakes Washington.

The foregoing projects included almost 1,000 miles of stream chan- iel surveys and 25 dam site surveys. These projects normally extend ver a 3-year period from start to completion. For the current year he work completed would be the equivalent of about 350 miles of hannel surveys and 10 dam site surveys.

As of June 30, maps resulting from the projects above outlined vere in various stages of preparation for publication for 550 miles of tream channel and 18 dam sites. Maps published during the year overed 163 miles of stream channel and 11 dam sites. Maps awaiting ublication cover 75 miles of stream channel and 6 dam sites.

During the year one report on waterpower resources was published s a water supply paper and four others were placed in open file. One eport on the geology of waterpower sites was published as a bulletin nd two were placed in open file. During the year a program was tarted of making systematic review and appraisal of the waterpower vithdrawals. Material was assembled for use in the periodic reports n developed and potential waterpower of the world.

Classification activities resulted in the addition of 56,700 acres to ower site reserves and elimination of 31,834 acres. The outstanding eserves in 23 States and Alaska show a net total of 7,128,615 acres. Reservoir site reserves were reduced to 134,823 acres by the elimination f 440 acres. Supervision of power projects under license with the Federal Power Commission was reduced to 129 by termination of licenses. Supervision was increased to 908 such projects under per- nit or grant from the Department of the Interior, 82 having been dded and 1 terminated. Supervision was increased to 189 in coop- ration with the Bureau of Indian Affairs, 2 having been added. ction involving hydraulic determinations was taken on 5,719 ases received from departmental sources and the Federal Power ommission.

upervision

Supervision is exercised over operations concerned with discovery, evelopment, and production of coal, potassium, sodium, phosphate, nd oil shale from public domain lands; of sulphur on public lands n Louisiana and New Mexico; of silica sand on certain lands in evada withdrawn by Executive Order No. 5105; of gold, silver, and ercury on certain Spanish land grants; of all minerals, except oil nd gas, on restricted allotted and tribal Indian lands, on "acquired ands" under the act of August 7, 1947, and provisions of section 402 f the President's Reorganization Plan No. III of 1946, on land in e California State Park under the act of March 3, 1933 (47 Stat. 487) and on National Forest land in Minnesota under the act of

June 30, 1950 (64 Stat. 311). Outstanding mineral leases and permi on acquired and Indian lands and lands subject to the aforementione acts involve the exploration for and production of bauxite, cobal, copper, gold, iron, lead, manganese, silver, nickel, titanium, tungste, uranium, vanadium, zinc, asbestos, bentonite, clay, coal, garne, gravel, gypsum, feldspar, fluorspar, limestone, marble, mica, pho-phate, pumice, quartzite, quartz crystal, sand, silica sand, sulphu, and vermiculite.

Responsibilities include investigating and reporting on applicatio for leases and prospecting permits; recommending lease terms, e-forcing compliance with lease terms and regulations governing t conduct of prospecting, mining, and beneficiation; protecting and co-serving the natural resources by preventing waste; determinin royalty liability; preparing statements, receiving payment of roya-ties and rentals, acting in an advisory capacity to the Office of t Secretary, other bureaus of the Department, and other Governme agencies.

As of June 30, 1956, under supervision were 2,536 properties i-volved in leases, permits, and licenses in 32 States and Alaska, of whic 1,297 were on public lands, 439 on acquired lands, and 800 on Indi lands. Production from such lands under supervision during t fiscal year is estimated at 19,728,000 tons, valued at $135,274,000, wi royalties amounting to $5,862,000. The production of coal from publ domain land in the United States and Alaska aggregated 5,788,5 tons, valued at $31,093,600 with a royalty value of $709,248. Produ-tion of coal in Alaska amounted to 607,747 tons. Potash producti amounted to 8,701,200 tons of crude and refined salts valued at $5 510,500 and having a royalty value of $2,336,750. The principal sour of sodium was Searles Lake, Calif., accounting for 790,400 tons of t total of 964,460 tons of sodium and associated compounds produc from lands under supervision. Total value and royalty value sodium were $25,189,750 and $827,084, respectively. Phosphate ro and shale production was 1,342,800 tons—931,896 tons from pub domain, 4,304 from acquired lands, and 406,600 tons from Indi lands. Production of lead and zinc concentrates from Indian lan amounted to 35,050 tons valued at $4,112,874 and royalty value $365,250. The output of uranium and vanadium ores from Indi lands was 516,697 tons valued at $10,692,607 and royalty value $1,204,930. Phosphate, coal, and sand and gravel made up the maj part of the remainder of the production from Indian lands totali 2,744,868 tons valued at $16,759,000 and royalty value of $1,706,1 Coal, fluorspar, zinc, asbestos, bentonite, phosphate, mica, mangane quartzite, quartz crystal, stone, and sand and gravel were produc from acquired lands in 13 States to an aggregate of 546,023 tons valu at $2,273,902 and royalty value of $92,167.

Oil and Gas Leasing

The oil and gas leasing supervision applies to operations for the discovery, development, and production of crude oil, natural gas, and products extracted from natural gas on Federal, Indian, and certain naval petroleum reserve lands. These duties were carried out during the year through 6 area offices and 21 district offices at 21 separate locations in California, Colorado, Louisiana, Montana, New Mexico, Oklahoma, Utah, Wyoming, and Washington, D. C.

On the public lands 99,567 oil and gas properties were under supervision at the end of the fiscal year, aggregating 72,709,487 acres in 24 States and Alaska. Drilling on public lands during the year included the spudding of 1,768 wells and the completion of 1,640 wells, of which 1,138 were productive of oil and gas. In all, 23,461 public lands wells, including 13,515 capable of oil or gas production, were under supervision on June 30, 1956. Production in 1955, amounted to about 119,680,000 barrels of petroleum; 285,601 million cubic feet of natural gas; and 196 million gallons of gasoline and butane, with royalty returns to the United States of about $42,183,000.

There were 4,161 acquired land leases embracing 3,853,369 acres in 9 States under supervision at the close of the fiscal year. Drilling on acquired lands during the year included the spudding of 65 wells and the completion of 66 wells, 27 of which were productive of oil and gas. In all, 548 acquired land wells, including 223 capable of oil and gas production, were under supervision on June 30. Including compensatory royalty allocated to the Rio Vista gas field the production from acquired land was about 5,240,500 barrels of petroleum; 3,995,000,000 cubic feet of natural gas; and 67,831 gallons of gasoline and butane, with royalty returns of about $2,253,000.

Operations on 11,685 leaseholds were supervised, embracing 3,357,-21 acres on Indian lands in 15 States. Drilling on Indian lands during the year included the spudding of 698 wells and the completion of 602 wells, of which 416 were productive of oil and gas. In all, 8,924 Indian land wells, including 4,955 capable of oil and gas production, were under supervision on June 30. Indian land revenues from rentals, royalties, and bonuses amounted to $19,942,965.

Drilling on military lands during the year included the spudding of 8 wells and the completion of 7, all productice of oil and gas. In all, 4 military land wells, including 52 capable of oil and gas production, were under supervision on June 30.

On behalf of the Department of the Navy, supervision was continued over operations for the production of oil, gas, gasoline, butane, and propane from 17 properties under lease in Naval Petroleum Reserve No. 2 in California. Production from 296 active wells totaled ,428,000 barrels of petroleum, 5,582,535,000 cubic feet of natural gas, of which 2,288,100,000 were net sales the remainder being gas injected for pressure maintenance, shrinkage, or fuel used on leases, and 9,685,600 gallons of natural gasoline with an aggregate royalty value of $1,071,000.

Work on the outer Continental Shelf involved supervision of 367 section 6 leases, originally issued by the States of Louisiana and Texas and over which jurisdiction was assumed by the Federal Government under provisions of the Outer Continental Shelf Lands Act, and 235 leases issued under section 8 of that Act, containing at the end of the year a total of 577 wells, 304 of which were productive of oil and gas Drilling on the outer shelf involved the spudding of 239 wells, and the completion of 210, including 123 producers. The production of petroleum from outer shelf in 1956 was about 120 percent greater than during 1955, and the production of gas was about 40 percent greater Revenues received during the year as royalties, rentals and bonuses totaled $119,718,000.

Activities toward unitization of oil and gas operations involving Federal land were reflected in the approval of 38 new unit plans during the year and the termination of 53 previously approved unit plans leaving 285 approved plans covering 4,844,136 acres outstanding. On the outer Continental Shelf, 8 such plans were approved during the year and the total now stands at 9, embracing 259,172 acres. About 50 percent of the petroleum, 28 percent of the natural gas and 62 percent of the gasoline and butane obtained from Federal lands during the year was produced under approved unit agreements. On Indian lands 17 new units were approved and none was terminated, the total number of plans in effect at the end of the year being 28, involving 76,496 acres. There were 99 drilling unit, or communitization, agreements approved during the year, making a total of 581 approved as of June 30. The only development contract approved during the year was in Alaska involving 1,200,000 acres. The total number of such approved contracts is now 7, 3 in Alaska and 4 in New Mexico, aggregating 3,378,000 acres.

TOPOGRAPHIC DIVISION

The preparation and maintenance of the quadrangle maps that make up the National Topographic Map Series is the major responsibility of the Topographic Division. Related activities include control surveys, research, preparation of special maps and supplying map information and aerial photography to the public.

During the year about 1,800 new maps were published and mapping projects were under way in every State of the Union, the Hawaiian Islands, Puerto Rico, the Virgin Islands, and Alaska. A total of bout 18,500 published topographic maps are now available for the nited States, Alaska, Puerto Rico, and the Hawaiian Islands.

The topographic mapping program continued to be directed toward tisfying the most urgent needs as determined by analysis of requests ceived from Federal map-using agencies and the States. New and ntinuing high-priority defense requirements and additional requests r mapping needed in minerals and water resources investigations nd development have continued to be dominant factors in guiding ur mapping efforts. Cooperative programs have been continued ith many of the States, enlarged in several, and started in a few.

Topographic maps produced by the Geological Survey are so degned as to content and accuracy in order to meet military requireents as well as a multitude of nonmilitary needs. Mapping accomlished primarily to meet national defense requirements included rategic areas along the perimeter of the United States, as well as eas surrounding nearly 100 military installations and many of the rincipal cities. New requirements received during the year included tiaircraft areas, the Fort Polk maneuver area in the south-central nited States and Fort Huachuca, Ariz. Nonmilitary requirements ere given added emphasis by the national minerals policy program, e recommendations of the President's Advisory Committee on Water esources Policy, the expanded highway program and the needs of e Federal Civil Defense Administration.

apping Programs and Map Production

During the year ending June 30, 1956, 2,353 maps were transmitted the Publications Office for printing and distribution. Of these, 289 represented new mapping by the Geological Survey; 175 were eological Survey revisions of existing maps; 52 were new maps comled by other agencies which, by interagency agreement, are published d distributed by the Geological Survey; 144 were civil editions of aps which had been compiled previously and published for military e of the Department of Defense; 105 were one-color advance edions; 6 were planimetrics; 3 State base maps, 45 index maps, and 17 ere urban area maps; and 517 maps were transmitted for reprinting.

The program of preparing maps of selected metropolitan areas was celerated to meet civil defense requirements. Maps of 16 cities were epared and printed. Maps of 26 additional cities were placed in oduction.

There were significant increases in and new programs for cooperion in several states. Indiana started a 10-year program to comlete the mapping of the Sate at 1:24,000 scale by increasing the anal State funds for this activity from $50,000 to $200,000. West

Virginia, which was completely mapped at 1:62,500 scale through cooperation from 1899 to 1931, started a new program to remap the State at 1:24,000 scale, contributing $200,000 for the current and fiscal year 1957. The Kansas State Geological Survey increased its funds from $14,000 to $23,000 for cooperative mapping in the first step of a planned gradual annual increase toward a completion program, and the State highway department provided $100,000 in additional funds for mapping specific quadrangles in connection with an expanded highway construction program. Wyoming started its first cooperative topographic mapping program. New programs were also started with the cities of Des Moines, Iowa, and Oklahoma City, Okla., and with De Kalb and Fulton Counties in Georgia.

The 7½-minute topographic quadrangle maps of Kentucky were completed and cooperation is continuing as an active map revision program. The largest cooperative program during the year was in the State of California with other major programs in Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Missouri, New York, Oklahoma, Tennessee, Virginia, West Virginia, and Wisconsin. Programs were also carried on in Arizona, Arkansas, Colorado, Connecticut, Georgia, Maine, Massachusetts, Michigan, Nevada, North Dakota, Pennsylvania, Texas, Vermont, Washington, Wyoming, and Puerto Rico.

In the continental United States 102,100 square miles of new mapping and 14,100 square miles of revision of existing maps was accomplished during the year. With these additions a total of about 40 percent of the area of the nation is now covered with good quality modern quadrangle maps of the National Topographic Series. (Details of mapping accomplished are shown in the table on page —).

Considerable progress was also made during the year on the 1:250,000 scale topographic map series of the United States being compiled by the Army Map Service. Published maps of the civilian edition are now available for about one-third of the United States (16 sheets) and compilation has been completed for an additional 20 sheets.

Mapping in Alaska continued in a large measure to be directe toward satisfying high priority requirements of the Department o Defense. In some areas equal attention was given to the mappin needed to support the development of the mineral, timber, and wate resources of the Territory. The general objective of this progra is to provide complete, accurate, coverage of Alaska at 1:250,000 scal and to map parts of the Territory at 1:63,360 scale where civil o defense needs justify the effort. The new 1:250,000 scale coverag will replace the existing provisional series.

A major achievement in Alaska was the acquisition of 83 percen of the aerial photography required to cover approximately 122,00 square miles of the Brooks Range area in northern Alaska. This accomplishment is made possible through use of the most advanced photogrammetric and field methods and equipment, thorough planning, and the use of helicopters and fixed-wing aircraft in field surveys.

Mapping on the inch-to-the-mile (1:63,360) scale was in some stage of progress on 606 Alaska quadrangles covering about 128,100 square miles. Actual accomplishment, in terms of stereocompilation was about 19,300 square miles. With 182 quadrangle maps published during the year, the total of published maps of this series is 519.

Mapping in the Territory of Hawaii was continued toward the ultimate goal of completely remapping the islands at 1:24,000 scale. Operations during the year were conducted on Oahu, Maui, and Hawaii, concentrating on requirements of the Department of Defense. With publication of the remaining 11 of 15 quadrangles covering the island the mapping of Oahu was completed. Four of the 17 quadrangles covering Maui were also published.

The 1:24,000 scale Virgin Islands mapping program was continued and three quadrangles covering St. Thomas Island have been published.

The program of continuous map maintenance or revision in Puerto Rico was continued under a cooperative agreement.

As a necessary framework to correlate the new mapping in correct elevation with respect to sea level, 12,300 miles of leveling were run. To correctly position the new maps on the surface of the earth, 5,600 miles of transit traverse were run and 49,300 square miles were controlled by triangulation. Computed results of the control surveys are available to the public upon request. During the year contracts were let for 61,500 square miles of precision aerial photography for topographic mapping purposes, of which approximately 30 percent was twin low-oblique coverage. The Air Force delivered 20,200 square miles of photography for use in the compilation of topographic maps of certain Air Force bases. Flying operations were resumed in northern Alaska to complete the project begun in 1955 of photographing 122,000 square miles of the Brooks Range area.

Activities of the Special Maps Branch were in large degree a continuation of the preparation of charts for the USAF Aeronautical Chart and Information Center. In assisting the Air Force program of maintaining worldwide coverage of aeronautical charts, an important contribution is made to the overall Defense program. In addition, many special maps were prepared for other Divisions of the Geological Survey and for other agencies of the Federal Government; these included photogrammetric and cartographic map compilation, map revision, preparation of shaded relief, color-separation drafting and photographic services. Among 185 foreign charts completed during the year for the Air Force were 9 color-separation charts; photo-compilation of 79 charts covering 173,000 square miles; 12,350 square miles of map revision; and 97 radar prediction charts. A total of 136 Air Force charts are in various phases of compilation and will be completed in the new year.

By agreement with the Operations Coordinating Board and in cooperation with the Navy Hydrographic Office, the Survey began mapping operations in Antarctica from aerial photographs made available by previous expeditions. Completed mapping for the year amounted to 142,000 square miles compiled principally from trimetrogon and radar-scope photography. This mapped area is represented on eight 1 : 500,000 scale sheets of the series complete with shaded relief and color-separation drafting for lithographic reproduction.

During the year several projects were completed for the Army Map Service. These included 56 shaded relief plates representing 56 foreign maps and a 2-year program requiring the compilation and color-separation drafting of 15 1 : 1,000,000 scale maps.

An accomplishment worthy of mention is the completion of planetable mapping of beach and adjacent areas extending from Bay Shore to Montauk Point, on Long Island, N. Y. These areas are the subject of a detailed beach erosion and hurricane damage study authorized by Congress and conducted by the Corps of Engineers. Geological Survey maps with planimetry complied by stereomethods served as their base map. A substantial saving has accrued to the Corps of Engineers because of these maps and their timely completion.

New mapping and map revision during the year for publication as 7½- or 15-minute topographic quadrangle maps in the United States (excluding Alaska) for each of the major phases of mapping activity are as follows:

	New mapping (square miles)	Map revision (square miles)	Total (square miles)
Photography			91, 000
Horizontal control	88, 600		88, 600
Vertical control	56, 900		56 900
Supplemental control	80, 200		80, 200
Stereocompilation	75, 400		75, 400
Field compilation	104, 800	14, 500	119, 300
Drafting and scribing			120, 400
Transmitted for reproduction			137, 600

In the fiscal year, work was in progress on 6,685 quadrangles. It usually requires about 3½ years to map a quadrangle and publish the result.

A detailed summary of map production covering new mapping, remapping, and revision, is shown in the following table:

Areas (in square miles) mapped during fiscal year 1956 for publication on standard scales

[Contour intervals, 5 to 100 feet]

State	Area mapped, scale			New mapping	Revised mapping	Total
	1:24,000	1:31,680	1:62,500			
Alabama	93			93		93
Arizona			2,970	2,970		2,970
Arkansas	61			61		61
California	6,210		13,100	16.357	2,953	19,310
Colorado	2,694		596	3,290		3,290
Connecticut		127			127	127
Delaware	538			176	362	538
District of Columbia						
Florida	4,210		645	3,484	1,371	4,855
Georgia	1,285		2,180	3,465		3,465
Idaho	594		258	797	55	852
Illinois	35		779	814		814
Indiana	2,657			2,628	29	2,657
Iowa	230		112	342		342
Kansas	2,204			634	1,570	2,204
Kentucky	373				373	373
Louisiana	334		1,325	1,153	506	1,659
Maine	44		3,990	2,096	1,938	4,034
Maryland	288			226	62	288
Massachusetts		176			176	176
Michigan	159		2.900	3,026	33	3,059
Minnesota	212		2,954	3,166		3,166
Mississippi						
Missouri	2,173		8	2,181		2,181
Montana	1,509		1,604	3 113		3,113
Nebraska	901			901		901
Nevada	95		5.215	5,310		5.310
New Hampshire	6		397	370	33	403
New Jersey	861			534	327	861
New Mexico	391		3,290	3.681		3,681
New York	2,637		1,294	2,361	1,570	3,931
North Carolina	553		738	1.286	5	1,291
North Dakota	1,222			1,222		1,222
Ohio	443			443		443
Oklahoma	1,228		1,205	2,312	121	2,433
Oregon	215		10,676	10,382	509	10.891
Pennslyvania	2,221		120	1,879	462	2,341
Rhode Island						
South Carolina	231			231		231
South Dakota	1,604			1,604		1,604
Tennessee	1,026			902	124	1,026
Texas	4,167		2,848	6.187	828	7.015
Utah	1,816		788	2,376	228	2,604
Vermont			207	207		207
Virginia	241		952	954	239	1,193
Washington	823		1,471	2,192	102	2,294
West Virginia						
Wisconsin	204		4,286	4,490		4.490
Wyoming	1,835		413	2,248		2,248
Total	48,623	303	67,321	102,144	14.103	116,247
Alaska			[1] 19,535	19,280	255	19,535
Hawaii	462			462		462
Puerto Rico		[2] 394			394	394
Virgin Islands						
Grand total	49,085	697	86,856	121,886	14,752	136,638

[1] 1:63,360. [2] 1:30,000.

Research and Development

The installation of new photogrammetric equipment, designed and developed by the Geological Survey, continued during the past year. The new items, which include ER–55 projectors, Twinplex plotters, aspheric-plate diapositive printers, and variable-ratio pantographs, are part of a more efficient system for topographic mapping that includes the use of twin photography, economical compilation scales, and scribing techniques for the production of the map manuscript. A United States patent was issued on the ER–55 projector, dated March 13, 1956, with all rights assigned to the Government.

A prototype model of the Orthophotoscope was built and is currently undergoing operational tests. The Orthophotoscope is an instrument used to make orthographic photographs from stereoscopic pairs of standard perspective pictures. Results of early tests indicate that the instrument will be a success and applications are foreseen in the fields of geology, engineering, and the military, as well as in mapping.

The first model of a twin-camera mount, based on a center-of-gravity design developed in the Geological Survey, was built and tested during the year. Indications are that such a mount may open the way to better resolution in the aerial photograph. This would greatly enhance the use of aerial photography in all photogrammetric operations. The mount has been loaned to the Air Force for further, more rigorous flight tests.

Tests conducted during the year have shown that the technique of using stereotemplets for the extension of horizontal ground control is not only feasible, but desirable in many cases. Stereotemplets are a development of the Geological Survey. One of the four main offices is already using the technique almost exclusively for its horizontal-control extensions. Wider adoption of the system is expected as more information is gained.

As a result of research performed by the Geological Survey the applicability of the ER–55 projector as an efficient high-oblique stereoplotter was proven. It was concluded that new trimetrogon photography taken with the latest precision cameras, ER–55 projectors, stereotemplet triangulation and vertical control extension by photoalidade can be combined to form a photogrammetric system capable of producing more accurate small-scale large-contour interval maps under the most adverse conditions of flying and available ground control.

The scribing process which has now replaced drafting as a map finishing procedure is being extended to field surveys. Meanwhile progress is being made in adapting it to stereocompilation work. The adoption of plotting scales that are the same as the reproduction scales, which is now underway, will represent further economies through elimination of conventional "final" rendering of certain plates. The efficiency of the process has been established and has increased considerably since its adoption. It will continue to improve as research and development provide new and improved instruments, register devices, scribe and strip coatings, sensitizers, and operation techniques.

In the continuing effort to improve the efficiency of control surveys, experiments were made in the determination of elevations fo supplemental control by altimetry. Efforts were directed toward refinement of the instruments themselves, improvement in the methods of using them, the application of corrections for atmospheric conditions, and better methods for computing the results. Accomplishments have been sufficiently encouraging to justify further research.

The tremendous advance in the uses of electronics offers tantalizing promise of potential savings to be gained in the execution and computation of control surveys. Continuing effort has been made to keep abreast of the latest developments in order that we may immediately put into use any practical device for electronic measurement or any more economical method of computation.

The program of converting telescopic alidades to optical reading auto-leveling instruments is continuing. All reports and tests of the converted alidades show improved accuracy and substantial operational savings in time.

An electronic line counter was developed and constructed which counts the line crossings on maps by sliding an electric microeye unit across the map sheet. The data are used in cost studies.

The rectoblique plotter has been redesigned to reduce time of operation and to improve its accuracy. Other research work included development of a small combination planetable board and light table for more expeditious field checking of scribed map manuscripts; tests of automatic levels and leveling rod graduations; studies and tests of stereotemplet materials.

Contour interval plans have been reviewed and approved for 36 of the 48 States. Plans have been received from the responsible Region offices for nine of the remaining twelve States, and considerable work has been done on review of those on hand. A summary plan for the United States, on a 1:5,000,000 base map, is being prepared.

Progress has continued in writing the new manual of Topographic Instructions. Of the proposed 138 chapters, 80 have been issued and 24 are in advanced stages of preparation. The parts of the manual concerning basic policies and field surveys are now virtually complete, and planning has begun for a sales edition.

Map Information Office

Expansion of business and industrial activity during the year was reflected in a general increase in the activities of the Map Information Office. Industrial concerns are showing more interest in the use of topographic maps in the conduct of various operations. Requests for topographic maps, aerial photographs, and geodetic control covered a wide variety of uses.

Maps and related information were sought for many different purposes—as aids to microwave station location; general planning for highway, railroad, and airport sites; development of real estate subdivisions and factory sites; for compliance with Federal requests for geographic coordinates of hundreds of key industrial facilities; for oil and gas, and mineral exploration and prospecting especially in connection with uranium exploration; for detailed study of terrain in the vicinity of airplane accidents by the Civil Aeronautics Board and the Civil Aeronautics Administration; for base maps by city and town planning and zoning commissions; and for the determination of commercial franchise area boundaries.

The past year also was marked by large increases in the strictly nontechnical use of maps and requests for map information. Several national magazines advised the public that topographic maps were available from the Geological Survey and that additional information and advice about map uses and sources was available. The public response was indicated by the large volume of inquiries directly traceable to each of several news stories. Most requests were for data for recreational purposes—hunting, fishing, camping, touring, and the like. These requests evinced a newly aroused interest in maps by an increasing number of persons who were unfamiliar with topographic quadrangle maps.

There were notable increases in sales activities. Aerial photo sales amounted to $95,000, an increase of nearly $10,000 over the preceding year. The distribution of geodetic control lists in 15-minute quadrangle units increased considerably. More than 38,000 lists were sent out on request.

As the result of an agreement with the Army Map Service, the Geological Survey took over the sale and distribution of all advance materials of the 1:250,000 scale series of United States topographic maps. Orders for this copy received from the public, as well as from State and Federal agencies, have exceeded expectations.

Aerial film taken in connection with the preparation of the 1:250,000 scale series of United States topographic maps is also being released to the Geological Survey by agreement with the Army and the Air Force on an indefinite loan basis. Coverage for approximately 45 percent of the area of continental United States was received during the year. Arrangements were also made with the Department of the Navy to accept, as it becomes available, Navy aerial mapping film of Alaska on an indefinite loan basis. Reproductions from all unclassified film are available to domestic users.

WATER RESOURCES DIVISION

The work of the Water Resources Division is to determine and appraise the Nation's surface and underground water resources During fiscal year 1956 there was a further increase in public interest in water-resource investigations, owing partly to local and regional floods or droughts, partly to increased competition for existing supplies by municipalities, agriculture, and industry, and partly to broadened public awareness of the importance of having adequate hydrologic data on hand before designing and building such structures as municipal waterworks, reservoirs, dams and bridges.

Water-resources investigations include the systematic collection, analysis, and publication of hydrologic and related geologic data; appraisal of water resources of specific areas; determination of water requirements for industrial, domestic, and agricultural uses; and research and development to improve the scientific basis of investigations and techniques.

Water-resources investigations are financed from directly appropriated funds, funds transferred from other Federal agencies for work performed directly for them, and from funds provided by States and municipalities for cooperative investigations. From the beginning of Federal-State cooperative investigations in 1895, the partnership arrangement has grown to include work in all 48 States and in Hawaii and Guam.

Funds made available by States and municipalities in 1956 for cooperative studies were:

State	*Obligation*
Alabama	$136, 350
Arizona	130, 706
Arkansas	51, 899
California	351, 052
Colorado	97, 098
Connecticut	34, 787
Delaware	34, 405
Florida	186, 114
Georgia	88, 030
Guam	19, 904
Hawaii	88, 899
Idaho	61, 615
Illinois	77, 347
Indiana	141, 430
Iowa	86, 686
Kansas	67, 156
Kentucky	147, 888
Louisiana	151, 657
Maine	12, 473
Maryland	61, 792
Massachusetts	41, 967
Michigan	80, 166
Minnesota	102, 988
Mississippi	44, 053
Missouri	36, 543
Montana	52, 882
Nebraska	80, 634
Nevada	31, 394
New Hampshire	18, 348
New Jersey	76, 560
New Mexico	164, 597
New York	219, 813
North Carolina	111, 849
North Dakota	45, 002
Ohio	160, 878
Oklahoma	101, 815
Oregon	73, 118
Pennsylvania	147, 315
Rhode Island	26, 583
South Carolina	33, 630
South Dakota	22, 007
Tennessee	87, 056
Texas	300, 102
Utah	92, 692
Vermont	8, 535
Virginia	84, 776
Washington	120, 063
West Virginia	27, 547
Wisconsin	45, 952
Wyoming	62, 284
Total	4, 528, 437

Surface-Water Investigations

The measurement and publication of basic information on streams, lakes, and reservoirs were continued on a comprehensive scale, with special emphasis given to the timely publication and release of data. These records provide a sound basis of facts for the study and analysis of many hydrologic and engineering problems.

Surface-water records were obtained at more than 6,800 sites in the 48 States and in Alaska, Hawaii, and Guam during fiscal year 1956. Surface-water records include 4,800 records collected in cooperation with 187 agencies of States or their subdivisions and 2,000 records obtained for Federal agencies such as the Corps of Engineers, Bureau of Reclamation, Tennessee Valley Authority, State Department, Soil Conservation Service, Atomic Energy Commission, and permittees and licensees of the Federal Power Commission.

Compilation of all streamflow records in the United States for the period 1888–1950, a project which was started in 1951, is now 68 percent complete. During the year, compilation volumes were published for the lower Mississippi River Basin and for the Pacific slope basins in Washington and the lower Columbia River Basin. Users of these summary streamflow reports, water-supply and sanitary engineers; designers and operators of flood-control systems, irrigation projects, and powerplants; and many others concerned with historical and long-term streamflow data, now have records of monthly and annual discharge figures and other data for given basins in a single volume, rather than nearly 50 volumes of the annual report series of water-supply papers.

Flood-frequency reports for Nebraska, Connecticut, and Missouri, prepared cooperatively by the Geological Survey, were published. Flood studies were in progress in six other States at the end of the year. Data were also being collected and preliminary analyses made for a nationwide flood-frequency study. When completed, this will provide a means for computing flood frequencies on all streams in the United States. The unit for analyses which have been started for New England and the Colorado River area, is the river basin.

Additional cooperative programs with State highway departments were started and several existing programs were expanded in scope. Data obtained provide better definition of the flood-producing characteristics of small streams, knowledge of which is essential to the design of adequate and economical drainage and flood-control structures. Hydraulic data for about 90 stream sites were furnished to various highway departments. The program of collecting flood-flow data on small streams by means of crest-stage and continuous gaging stations was enlarged.

Considerable progress was made in developing techniques for relating single measurements of low flow in ungaged streams to correlative records of flow at stream-gaging stations, in order to deduce the characteristics of small streams during periods of low flow.

Devastating floods of August-October 1955, extending from New England to North Carolina, were documented by intensive field investigations and a preliminary report was published in USGS Circular 377. Similar investigations followed the floods of December and January in the west coast area, and a preliminary report is being published as USGS Circular 380. Final reports on the floods in both sections of the country will be prepared.

An intensive review was completed of the scope and adequacy of the stream-gaging network in the Colorado River Basin. The derived methods of review were sufficiently fruitful that a review of the nationwide stream-gaging network was begun in June 1956 and was scheduled to be completed within a year. A hydrologic network will be defined, setting up (1) "primary" stations, which will be operated indefinitely to give long-term trends, and (2) short-term "secondary" stations to give area coverage. This will aid planning of the program for collecting basic surface-water data.

Sixteen interstate compacts for apportionment and division of interstate waters are now in effect and seven are under negotiations. These compacts include provisions for the measurement of streamflow, commonly by the Geological Survey.

Water resources investigations were made along the Canadian boundary, as required by the Boundary Waters Treaty of January 11, 1909, between the United States and Canada, or by order of the International Joint Commission.

Ground-Water Investigations

The growing importance of ground water to the Nation caused a continued increase in demands for information on which to base plans for use and conservation of this critical natural resource. Mutual Federal and local interest was reflected in cooperative programs in 44 of the States, Hawaii, and Guam. Of 550 ground-water investigations underway during the year, about 80 percent were in the Federal State cooperative program.

About 100 of the projects concerned problems in which the primary interest is National, or in which Federal agencies are directly concerned. Departments of Defense, State, Agriculture, and Health, Education, and Welfare, several Bureaus in the Department of the Interior, and the Atomic Energy Commission are examples of agencies having direct or preponderant interest in specific water problems.

The greater part of the effort was directed toward area investigations and reports on the geology and ground-water resources of geographic or hydrologic units, commonly of counties or ground-water basins. These studies contribute to the overall objective of a nationwide coverage and a national inventory of water resources. Supporting studies included research into the principles of occurrence and movement of water in various geologic and hydrologic environments, systematic inventories of the draft on ground water, and studies of water-level fluctuations. Research, besides adding directly to knowledge of hydrogeologic principles and processes, leads to improved techniques for the analysis and solution of water-supply problems. Inventories kept current, provide records of operating experience with ground-water reservoirs.

During the year 144 scientific reports and papers on investigations were published for public information, and 142 reports were released to the "open" file. The published reports include 16 water-supply papers, 1 professional paper, 5 circulars, 45 reports published by cooperating agencies, 2 contributions to The Yearbook of Agriculture, 44 papers in scientific journals, and 31 reports in duplicated form. About 40 additional reports were prepared for administrative release to Federal agencies.

The diversity of problems investigated throughout the country is illustrated by a few of the reports. One on ground-water resources of the San Luis Valley in Colorado shows that the shallow alluvial aquifer is overdeveloped in places, but that additional supplies can be obtained in large areas; also, that relatively large additional supplies can be obtained from artesian aquifers. In the Puget Sound area of Washington, Pleistocene deposits (those accumulated during the ice age), contain what may be that area's only large supplies of ground water of good quality for agricultural, industrial, and municipal use. On the east coast, ample ground-water resources were reported in the historic York-James Peninsula of Virginia.

In northeastern Arizona, a highly successful program for the location and development of adequate domestic and stock supplies by wells was in progress in the arid Navajo and Hopi Indian Reservations. In contrast, excessive recharge from the infiltration of irrigation water has caused drainage problems in the Riverton area and in the vicinity of Kaycee in the upper Powder River basin in Wyoming. Along the Ohio River, large quantities of water are available from the alluvium, whereas in the nearby Paducah area only small to moderate supplies can be obtained.

Research on artificial recharge was continued in Arkansas, and additional work was done in Texas, Oregon, and Alaska. Also, a comprehensive report on the Putah Creek area in Solano County, Calif., discusses many of the complex elements that would affect use of the underground storage capacity for integrated operation of the Monticello Reservoir and the ground-water reservoirs.

A report on phreatophytes, which was completed and is in process of publication, revises and expands considerably the information in an earlier water-supply paper. These deep-rooted, water-loving plants take water directly from the zone of saturation and waste millions of acre-feet of water each year.

A paper entitled "The quantitative approach to ground water," by J. G. Ferris and A. N. Sayre, traces the history and development of the quantitative concepts and techniques now widely used in the appraisal and interpretation of ground-water resources.

Chemical-Quality Investigations

During 1956, notable progress was made in determinations of the quantity, type, source, and distribution of dissolved minerals in natural waters. About 65,000 samples from streams, lakes, springs, and wells were analyzed. The majority come from about 600 key locations, mostly on streams. About 8,500 samples were from wells and springs.

In addition to the nationwide program, more detailed chemical-quality investigations were made of streams in the basins of the Colorado, Missouri, Pecos, and Columbia Rivers; in New York and the New England States and in Alaska. Also, a sampling network was maintained on western streams to determine trends in mineral content that would affect successful continued operation of western irrigation projects. Investigations were made in cooperation with State and municipal agencies in 16 States, and special chemical-quality studies were made for the Department of Defense, Atomic Energy Commission, Bureau of Reclamation, Veterans Administration, Federal Housing Authority, and Public Health Service.

Reports on the chemical quality of natural waters, issued during 1956 and having special interest, included those on the Colorado River Basin for the period 1925–40; the quality of surface waters for irrigation in the Western United States in 1952; the chemical characteristics of surface waters in the Devils Lake Basin, North Dakota; and the quality of surface waters in the Wind River Basin, Wyoming. Reports describing chemical characteristics of surface waters of South Carolina, Texas, New York, Kentucky, North Carolina, and Oklahoma were prepared in cooperation with those States. Studies were continued of public water supplies of the larger cities of Alaska, Hawaii and Puerto Rico.

Temperature variations in time and place are of special importance to waterworks, industry, fish culture, and sediment-transport studies. Measurements were made also of water temperatures as a regular part of the quality investigations. Daily observations or continuous recordings of temperature were obtained during 1956 at more than 400 sites on important streams. Periodic measurements were made at many additional river locations.

Sediment Investigations

Study was continued during 1956 of the sources, quantity, and movement of waterborne sediments and their effects on reservoir storage, navigable waterways, diversion works, and irrigation canals. Measurements were made regularly of sediment in suspension at about 200 locations. Comprehensive investigations were continued in the Missouri, Middle Rio Grande, and Colorado River Basins. These studies provided information about the sources of sediment, rates of discharge, and other pertinent factors in these areas to aid extensive Federal programs of water development.

The results of sediment investigations in the Wind River Basin were published in Water-Supply Paper 1373. The program of the U. S. Soil Conservation Service was assisted by studies of sediment yields and the trapping efficiency of reservoirs on small watersheds in North Carolina, West Virginia, Kentucky, Georgia, Nebraska, Oklahoma, and Texas. Special sediment studies were made for the Bureau of Reclamation in the Rio Grande and Colorado River Basins and in the watershed of Medicine Creek, Nebraska.

Investigations of sedimentation were continued in cooperation with Iowa, Wisconsin, Kentucky, Ohio, Pennsylvania, and Virginia. These included intensive studies of several small watersheds in Pennsylvania and Wisconsin to measure and explain changes in runoff and discharge of sediment induced by conservation practices.

Other Special Investigations

Comprehensive reports on the water resources of industrial-production areas were prepared in continuation of a series started in 1953. At that time the Business and Defense Services Administration requested an expanded program for the preparation of summary reports on the overall water resources and water situation in a number of important industrial centers. Manuscripts were prepared or reports published on the following areas during fiscal year 1956: Tacoma, Wash., New Orleans, La., Yadkin-Pee Dee River Basin, N. C., Neuse River Basin, N. C., Mobile, Ala., and Portland, Oreg.

Studies were continued of the water requirements for specific industries. A report on the water requirements of the carbon-black industry was published in 1956. Studies of the rayon, acetate-fiber, and aluminum industries were completed and manuscripts prepared.

The inventory of the occurrence and quality of saline water resources of the United States was continued. Activities were concentrated in New Mexico, for which a substantial amount of information is available. A study of the saline waters of North Dakota was completed.

Continued progress was made in the development of procedures and techniques for collection and appraisal of facts about radioactive substances dissolved in water. Special emphasis is being given to dissolved radio-elements in relation to geologic, chemical, and hydrologic factors. Studies of specific terranes were made in Texas, Colorado, Idaho, Nevada, and Arizona, and single-samples of water were collected from many sources throughout the United States. The work provides useful background data for studies of radioactive contamination of water, contributes to understanding of the occurrence of radioactive substances in water, and provides clues to the geologic environment through which the water has passed.

Research and Development

Active research in hydraulics and hydrology produced several significant results. A major improvement was achieved by purchasing an electronic computer that automatically tabulates daily discharges directly from the gage charts. Previously this work was done by time-consuming manual means. The device allows better use of time and manpower and saves many times its own cost. A step toward elimination of costly stilling wells at stream-gaging stations was taken by developing a bubbler-type sensing device to activate the stage recorder. Considerable progress was made in field studies of the factors that affect the artificial recharge of ground water, and of the principles that control the movement of water through unsaturated porous media. Further development was achieved of an electrical analog model for analyzing the hydraulic properties of nonhomogeneous aquifers. Rigorous field testing has demonstrated the ability of a new type of recorder to register continuously the electrical conductivity of water. This instrument promises a major advance toward economical collection of additional information about the load of dissolved solids in river waters. Studies completed during the year demonstrate that graphic plottings yield curves showing the relation between the sediment loads of rivers and the rate at which they discharge water. When the graphic relation is supplemented by occasional direct determinations of sediment load, the method can be used to compute the total load of sediments discharged during monthly and annual periods. This method is sufficiently accurate for many water-resource development problems.

A report on evaporation losses from Lake Mead, presenting the results of comparing extensive experimental techniques with records of actual water loss from the lake surface, was completed and placed in open file pending publication. Research in the theory of evaporation and in techniques for its measurement under a variety of conditions was continued.

Soil and Moisture Conservation

Investigations by the Geological Survey of various aspects of hydrologic and geologic conditions on public lands provide basic data necessary for the efficient use and management of those lands. The work is part of the soil-moisture-conservation program of the Department of the Interior and is dedicated to improvement and maintenance of the productive value of the 280 million acres of Federal land under the stewardship of the Department. Special attention was given to comprehensive investigations of water supplies in grazing areas in western Utah, southwestern Colorado, Nevada, and western Wyoming.

Technical Assistance Program

The overseas water-resource work by the Geological Survey was begun on a continuing basis in 1950, under terms of the United States technical assistance program. During 1956 agreements were in effect between the Geological Survey and the International Cooperation Administration. The investigations originated through requests for technical assistance from the various countries. Such requests were then relayed by the United States overseas missions.

Long-term projects were under way in eight countries at the end of fiscal year 1956. Six of these were primarily ground-water investigations and two were surface-water studies. The projects generally combine the training of a nucleus of foreign nationals in the methods and techniques of hydrologic investigations, with investigations of specific foreign areas in which water development has been proposed. At the end of the year, more than 100 nationals were receiving in-country training by Survey personnel on field projects in Afghanistan, Chile, Egypt, India, Iran, Libya, Pakistan and Peru. Compilation of the results of 5 years of geologic mapping and field reconnaissance in Saudi Arabia was continued in Washington with principal attention to preparation of a base map. A ground-water hydrologist was assigned to the Government of Jamaica for an initial period of 6 months, subject to extension, to advise on ground-water problems and to demonstrate methods and techniques for ground-water investigations. During the year, visiting citizens of the Belgian Congo, China, Egypt, Formosa, Iran, Iraq, Pakistan, and the Philippines received training in the United States.

Work on Publications

The primary purpose of the Geological Survey is to provide for the people and the agencies of Government, information necessary for the exploration, development, and conservation of our mineral and water resources. As this information becomes available through investigations, surveys, and research, fulfillment of this purpose is served by publication of a variety of reports, maps, and charts. The information is published in part by the Survey, in part by cooperating States, and in part by many scientific journals. These publications include maps of the topographic and geologic features of the Nation, studies of mining districts and mineral deposits, of the composition and structure of rocks and minerals, of fossils and the rocks in which they are found, of geophysics and geochemistry, and studies of streamflow, ground waters, and their chemical quality.

During fiscal 1956, 849 reports including geologic and hydrologic maps were submitted for publication. Of these 356 were for publication by the Geological Survey, 41 as professional papers, 92 as bulletins, 49 as water-supply papers, 15 as circulars, and 159 in the various map series, and the remainder for publication by cooperating agencies or scientific journals.

Preparation

In this period 180 new manuscripts were sent to the printer and 147 were published. Work on new manuscripts prepared in fiscal year 1956 included the editing of 24,120 pages; checking of 3,733 galley proofs and 12,817 page proofs. Printed reports delivered included 17 professional papers, 60 bulletins, 45 water-supply papers, 8 circulars, 14 chapters for the new edition of the topographic manual, and 3 hydrologic atlases.

Illustrations to accompany reports published by the Survey were prepared at an increased rate. Completed and transmitted for publication were illustrations for 105 reports, an increase of 13 over the preceding fiscal year. The 57 bulletins, 28 professional papers, 19 water-supply papers, and 1 hydrologic atlas included in this group, and an additional 8 circulars, required 2,677 drawings and photographs, of which 137 were for multicolor reproduction.

Final copy for 188 geologic maps for publication in the Geological Survey's map series and 2,353 topographic and related maps were transmitted for reproduction.

Map Reproduction

The production of maps increased about 13 percent over the past fiscal year. The following is a summary of map reproduction work:

	New	Reprinted
Topographic and related maps:		
Standard topographic	[1] 1,856	[2] 303
Standard topographic (Engineers)	2	249
Standard topographic (revisions)	[3] 100	----------
1:250,000 scale	[4] 20	[4] 12
Scale conversion	37	----------
Planimetric	11	21
State base	7	11
State topographic indexes	43	----------
Status index	1	3
Miscellaneous	5	100
Geologic maps:		
Geologic quadrangle	28	----------
Mineral investigation	25	3
Geologic indexes	2	2
Coal	12	----------
Oil and gas maps	25	5
Oil and gas charts	5	----------
State geologic	2	----------
Geophysical Investigation	1	2
Geologic status	1	----------
Miscellaneous	104	1
River Survey maps	17	----------
Water Resources maps	3	----------
Total	2,307	712

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[1] Includes 10 printed by other Government agencies.
[2] Includes 18 printed by other Government agencies.
[3] Includes 20 printed by other Government agencies.
[4] Printed by other Government agencies.

These 3,019 new and reprinted map editions comprise 8,995,432 copies and 42,869,800 impressions, of which 8,798,962 copies and 41,733,800 impressions were printed in the Survey's plant. These maps range in size from 18 by 22 inches to 50 by 72 inches. They included the geologic State map of Montana and 13 city and vicinity maps, such as Cleveland, New Orleans, Salt Lake City, and San Diego.

In addition to the foregoing production, 1,328 jobs comprising miscellaneous maps and other preliminary map services were completed. This printing includes 324 maps amounting to 601,198 copies and 5,162,984 impressions of which 115 were illustrations comprising 443,700 copies and 1,633,000 impressions for the Government Printing Office. The rest of the miscellaneous printing and service was done for other units of Government. Also 2,023 type jobs (impressions on cellophane for map preparation) were delivered, and 587 maps were mounted on cloth.

The total cost of all production was $1,545,502. Of this amount $25,688 was received from other agencies for map sales, and $23,874 was received for printing or service work. The remainder of the cost, $1,495,940 was charged to Survey funds. These costs do not include $12,064 representing negotiated credit the value of maps received from Army Map Service on an exchange basis.

A summary of the work performed in the Survey's reproduction plant includes: reproduction and delivery of 9,400,160 map copies (46,896,784 impressions); preparation of 12,274 photolithographic printing plates, 1,121 printing plates, 10,406 photolithographic negatives, 8,932 photographic negatives ranging from 2 by 2½ inches to 30 by 40 inches, 15,054 prints ranging from 1½ by 2 inches to 40 by 72 inches; preparation of 606 lantern slides; developing and printing of 59,100 feet of 35 mm. aerial film; and the mounting of 814 prints.

Distribution

The warehousing of Geological Survey publications is handled through facilities at Washington, Denver, and Fairbanks, and distribution of maps, folios, and circulars from these points is aided by 11 other Survey field offices. Further distribution is carried out by 435 commercial agents who purchase maps for resale to the public.

In addition to approximately 29 million items on hand at the beginning of the year, 277,000 copies of 214 separate reports in book and pamphlet form (printed by the Government Printing Office and the Interior duplicating section) and 9 million copies of 3,019 new and reprinted maps printed by the Geological Survey were received.

The distribution of approximately 3,300,000 maps and 275,000 book reports and pamphlets during fiscal year 1956 was an increase of 62,000 copies over the preceding year and represented the largest annual volume of distribution by the Geological Survey to date. In addition, more than 100,000 copies of the Survey's monthly announcements of new publications were distributed through the Superintendent of Documents. This total distribution was accomplished through the receipt and processing of more than 200,000 individual requests and resulted in the receipt of $410,000 from the sale of maps, $26,000 of which was received from other Federal agencies. These receipts do not include $12,064 representing the negotiated credit value of maps supplied to Army Map Service on an exchange basis. The distribution of maps for official, educational, and congressional use continued to be approximately 33 percent of all maps distributed.

The total number of copies distributed by Geological Survey offices as compared with fiscal year 1955 is shown in the following table:

	Fiscal year 1955 maps, reports, and indexes	Fiscal year 1956 maps, reports, and indexes	Percent increase or decrease
Washington	[1] 2, 293, 300	2, 438, 250	+6
Denver	[1] 964, 600	878, 550	−9
Fairbanks	[1] 35. 850	44, 200	+23
Other field offices	[1] 203, 850	198, 950	−2
Total	3, 497, 600	3, 559, 950	+2

[1] **Figures adjusted to revised reporting procedure.**

Public Inquiries Offices

Establishment since June 1950 of five Public Inquiries Offices in Denver, Colo., Salt Lake City, Utah, San Francisco and Los Angeles, Calif., and Anchorage, Alaska, has resulted in a substantial improvement in the availability of the results of Survey investigations to the public. These offices carry stocks of Survey maps and reports concerning their respective areas, answer all types of inquiries, and direct specific questions on technical matters to appropriate Division technical officers. Maps and reports are sold "over the counter" but the offices are not equipped to handle mail orders.

FUNDS

During the fiscal year 1956, obligations were incurred under the direction of the Geological Survey totaling $49,269,237. Of this amount 57 percent was appropriated directly to the Geological Survey, 30 percent was made available by other Federal agencies, and 13 percent by States and their political subdivisions.

Source and use of funds in fiscal year 1956

Topographic surveys and mapping:		
Geological Survey appropriation		$11, 808, 861
Reimbursements from non-Federal sources:		
States, counties, and municipalities	$1, 263, 510	
Sale to the public of aerial photographs and photographic copies of records	90, 278	
Sale of personal property	39, 483	
		1, 393, 271
Reimbursements from other Federal agencies:		
Bureau of Reclamation	1, 019, 044	
Department of the Air Force	707, 666	
Department of the Army	555, 700	
Department of the Navy	209, 000	
Miscellaneous	291, 383	2, 782, 793
Total appropriation and reimbursements		15, 984, 925
Direct State payments		7, 813
Total, topographic surveys and mapping		15, 992, 738
Geologic and mineral resource surveys and mapping:		
Geological Survey appropriation		5, 718, 441
Reimbursements from non-Federal sources:		
States, counties, and municipalities	$215, 686	
Sale of personal property	20, 898	
		236, 584

Geological and mineral resource surveys and mapping—Continued		
Reimbursements from other Federal agencies:		
Bureau of Reclamation	$111, 538	
Defense Minerals Exploration Administration	440, 827	
Department of the Army	1, 022, 765	
Department of the Navy	338, 507	
Atomic Energy Commission	5, 579, 244	
International Cooperation Administration	577, 077	
General Services Administration	258, 931	
Government Printing Office—map reproduction	96, 259	
Miscellaneous	114, 029	$8, 539, 177
Total, geologic and mineral resource surveys and mapping		14, 494, 202
Water resources investigations:		
Geological Survey appropriation		7, 655, 038
Reimbursements from non-Federal sources:		
States, counties, and municipalities	$3, 592, 863	
Permittees and licensees of the Federal Power Commission	123, 182	
Sale of personal property	49, 333	
		3, 765, 378
Reimbursements from other Federal agencies:		
Bureau of Reclamation	995, 641	
Department of the Army	1, 102, 247	
Department of Agriculture	181, 794	
Atomic Energy Commission	341, 398	
International Cooperation Administration	479, 684	
Miscellaneous	511, 055	3, 611, 819
Total appropriation and reimbursements		15, 032, 235
Direct State payments		1, 021, 051
Total water resources investigations		16, 053, 286
Soil and moisture conservation: Geological Survey appropriation		104, 010
Supervising mineral leases and classification of lands:		
Geological Survey appropriation		1, 787, 557
Reimbursements from non-Federal sources: Sale of personal property		1, 387
Reimbursement from other Federal agencies: Miscellaneous		51, 249
Total, supervising mineral leases and classification of lands		1, 840, 193
General administration: Geological Survey appropriation		784, 808

Summary:		
Geological Survey appropriation		$27,858,715
Reimbursements from non-Federal sources:		
States, counties, and municipalities	$5,072,059	
Miscellaneous	324,561	
		5,396,620
Reimbursements from other Federal agencies		14,985,038
Total appropriation and reimbursements		48,240,373
Direct State payments		1,028,864
Grand total		49,269,237

BUREAU OF MINES

Thos. H. Miller, *Acting Director*[1]

FOREWORD

SOARING demands for minerals and fuels to feed the Nation's upsurging economy formed the background for endeavors and attainments by the Bureau of Mines in fiscal year 1956 in promoting conservation of resources and furthering safety in the mineral industries.

Efforts to broaden the Nation's resource base of metals and nonmetallic minerals were emphasized during the year and were encouraged by a 40-percent increase in funds to permit strengthening of much of this work in the coming fiscal year. More was learned about the extent and character of submarginal deposits, and advances were made in developing methods for utilizing them. New, superior alloys to meet more exacting requirements were developed, and progress was made in synthesizing strategic materials in which the Nation is deficient.

Two important factors affecting the Bureau's fuel programs were a dramatic upswing in the bituminous-coal industry and failure of the anthracite industry to share in this growth. Simultaneously there occurred stronger preference for liquid and gaseous fuels.

The Bureau's research on mining, preparation, carbonization, and combustion of coal continued, and, in cooperation with industry, a special study was made which outlined more than 200 possible fields of coal research. Work on anthracite was concentrated on finding new uses and on instituting a cooperative program with the Commonwealth of Pennsylvania for conserving reserves threatened by flooding.

Research designed to increase ultimate recovery of petroleum and to point the way to its more efficient refining, storage, and use progressed steadily with the aid and cooperation of industry. Important studies in the transportation and storage of natural gas were completed. In addition, methods of obtaining liquid and gaseous fuels from coal and oil shale were studied in a continuing effort to assure this Nation an adequate supply of such fuels at some future time.

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[1] J. J. Forbes was Director of the Bureau of Mines until November 30, 1955. Thos. H. Miller was Acting Director throughout the remainder of the fiscal year.

Production of the lightweight, inert gas helium reached a new high as demands from Government, industry, and research groups continued to soar. A temporary shortage early in the fiscal year was overcome, but limitations can be expected until expansion of the Bureau's helium plant at Exell, Tex., is completed in the spring of 1957.

Cooperating with the Public Health Service and industry's Coordinating Research Council in air-pollution studies, the Bureau began research on the role of automotive exhaust gases. An automobile engine and precision instruments were installed for this work, which will involve analysis of exhaust gases created under various operating conditions.

The Bureau strengthened its safety educational program, first instituted 46 years ago, and concentrated on research to lessen the roof-fall hazards in mines. As coal-mine inspection work under the Federal Coal Mine Safety Act became increasingly effective, there was a substantial decrease in safety violations.

Failure of coal-mine fatalities to decline, even though the year passed without a major disaster, showed the need for increased attention by management and labor to day-to-day occupational hazards.

Two important developments in the Bureau's program of testing equipment for safe use in coal mines were the adoption of standards for approving underground lighting systems and for testing the fire resistance of conveyor belts.

Major policy decisions in Government continued to lean heavily upon compilation and interpretation of facts regarding foreign and domestic mineral production, consumption, and reserves. Meanwhile, the Bureau helped friendly nations conserve and develop their own mineral resources and worked with the International Cooperation Administration by sending technologists abroad and by training foreign mineral and fuel technologists brought to America to observe and learn.

The Bureau and its employees were honored by representation on many technical, industrial, and Government committees and boards, including the American Gas Association, American Society for Testing Materials, the American Institute of Mining, Metallurgical, and Petroleum Engineers, the National Academy of Sciences, the American Petroleum Institute, the Interstate Oil Compact Commission, the American Chemical Society, and the American Standards Association.

Details of these and the many other developments of the year are described in the sections that follow.

MINERAL DEVELOPMENT

Mineral consumption continued upward in fiscal year 1956, taxing many mines and plants to capacity. Recognizing the growing pressure on our resources, Congress increased the Bureau of Mines appropriations for mineral research and related studies in the coming year.

In 1956 Bureau services to the Office of Minerals Mobilization were expanded, and a liaison office was established, staffed by 2 top members of the Bureau of Mines, serving on rotating assignment, 2 consultants, and a full-time secretary. Eighteen special reports were completed by the Bureau for OMM.

The Bureau continued participation, with the Geological Survey, in the Defense Minerals Exploration Administration program fostering discovery and development of new sources of strategic and critical minerals. Bureau-Survey field teams examined loan applicants' properties, recommended actions, and directed and reported on DMEA projects underway. The Bureau also continued to provide technical assistance for the General Services Administration at mines and plants holding Government contracts.

Base Metals

Marked improvement in ore recovery, which will mean substantial conservation of resources, is expected to result from applied physics studies which were underway by the Bureau at three of the Nation's largest underground copper mines. As with past research of this type, results will be made available to the entire industry.

Information on low-grade Red-Bed copper deposits in Colorado and New Mexico were compiled, and investigations of copper deposits in remote areas in Washington and Alaska still were in progress at year's end. In another phase of the investigation encouraging progress was noted in recovering more copper from oxide and oxide-sulfide ores. Further studies extending into the new fiscal year will cover beneficiation, hydrometallurgical, and pyrometallurgical problems.

Efforts to conserve lead and zinc included compilation of mineral atlases, helpful in exploration, and research to evaluate geophysics for discovering additional ore in the Tri-State mining district of Missouri, Kansas, and Oklahoma. Experiments were conducted for improving recovery of lead and zinc sulfides lost in present milling practices. Efforts to recover zinc from oxidized ores by caustic leaching and by chemical precipitation progressed, as did long-range work to improve zinc-base alloys.

An extensive program on secondary nonferrous metals gave encouraging results. Invention reports were filed on a vertical amalgam electrode and a new chloride electrolyte for recovering pure metallic zinc from galvanizers' residue. An improved retort for use in vacuum-distillation furnace processes was developed to a semicommercial stage, and progress was made in recovering tin from "hardhead," a tin-smelter waste, by selective oxidation of iron. Work also was continued on a process to recover a bulk sublimate of cadmium, germanium, and other valuable metals from zinc concentrates, and the Bureau successfully completed the first phase of a study on separating magnesium and cadmium from a magnesium-cadmium-aluminum alloy.

Mercury-resources studies were expanded in 1956. Methods for treating complex Alaskan mercury-antimony ores were developed and now are being adapted to continuous operation to facilitate their possible use by industry.

Ceramic and Fertilizer Materials

As part of its extended program for conserving western phosphate-rock resources, the Bureau continued to participate with industry in testing and redesigning its experimental pneumatic vibrating-blade planer for underground mining. These tests proved that certain phosphate rock can be planed and that some advantages are gained by long-face planer mining. Since no blasting is required, a cleaner product results. Furthermore, the need for supporting pillars may be reduced, permitting higher recovery and consequent extension of phosphate resources. By the end of the fiscal year enough operating facts had been obtained to permit design of an improved planer for testing under varied conditions.

Late in the year regional and headquarters representatives established new standards for selecting projects in the Bureau's long-range ceramic-materials programs. Clay resources, particularly in Washington, Idaho, Colorado, and Utah, were reconnoitered and evaluated.

Research went ahead on carbides, borides, silicides, and nitrides as substitutes for industrial diamonds and as possible high-temperature refractory materials.

With the major objective of developing substitutes for strategic muscovite block and film mica, the Bureau conducted research on factors affecting crystallization of fluorphlogopite mica, sought new compositions superior to those now used, and studied reconstitution of flake synthetic mica into sheets suitable for strategic and nonstrategic uses. Although much progress has been made in this field, the Bureau recognizes the need for deeper studies covering the properties of synthetic-mica compositions and factors affecting the growth of large crystals.

Construction and Chemical Materials

The Bureau conducted laboratory and pilot-plant research on methods for recovering fluorine from phosphate rock and low-grade phosphatic shales and plans to expand this work to cover low-grade fluorspar deposits. Studying the fluorspar situation intensively, it also prepared several special reports for the Office of Minerals Mobilization and other Federal agencies.

Bureau engineers examined California and Maine asbestos deposits, while metallurgists studied the possible byproduct value of small percentages of chromium and nickel observed in the Maine drill cores. Basic investigations of properties important to asbestos technology were emphasized, and further progress was made in synthesizing asbestos or asbestoslike fibers. At year's end research on fiber crystallization was in progress and the possibility of patenting a product combining synthetic fluoramphibole with synthetic mica was under consideration.

Entering a new and important field, Bureau engineers began studying water problems of the mineral industries. These projects concerned the quality of water required by processing plants and the mineral constituents of waterborne wastes.

Recognizing that the new national highway-construction program poses many materials problems, the Bureau completed a second survey of future cement production capacity and began studying the availability of concrete aggregate supplies.

Ferrous Metals and Ferroalloys

The year's major items in the Bureau's program to assure adequate domestic iron-ore output involved searches for improved production methods and satisfactory metallurgical classification of deposits. More than 800 bulk samples of Lake Superior taconite were classified, and extensive ore-dressing tests were made on low-grade iron ore from Texas, the Southeast, and the Pacific Northwest and on titaniferous iron ore from Alaska.

Seeking improved steelmaking techniques, the Bureau obtained new information on high-temperature reactions, studied the effects of boron and rare earths on mechanical properties of steel, and counted advances in resulfurizing and decarburizing molten steel by jet injection. It continued work on the portable top-fired scrap preheater it had developed to cut metal losses and melting time in steelmaking furnaces.

In research on utilizing submarginal domestic manganese resources, the Bureau obtained good recoveries by percolation leaching of wad ores with sulfur dioxide and by ammoniacal-ammonium carbonate leaching of reduced materials from Aroostock County, Maine. A report disclosed 59 million long tons of material averaging 4.9 percent manganese in 25 percent of the Batesville, Ark., district surveyed. Tests showed that a concentrate acceptable for the national stockpile can be prepared from it. Other research showed that within certain limits titanium can be substituted for manganese to overcome the harmful effects of sulfur in steel.

Studies in upgrading domestic chromite included producing chromium alloys experimentally by direct smelting of ore and concentrate and improving methods of creating and fabricating high-purity ductile chromium. Samples were given other Government agencies and industry for further study. Beneficiation of chromite-bearing laterites proved encouraging, and refractory properties of Oregon and Montana chromites were studied further.

Massive ductile molybdenum was produced experimentally by Bureau metallurgists, who also made progress in developing methods for treating low-grade, complex tungsten ores. Examination of tungsten deposits yielded more knowledge of potential domestic resources of this essential metal.

Another ferrous-metals study was aimed at lowering the cost of producing vanadium metal in an effort to encourage its wider use.

Metallurgical projects on nickel involved ways of treating ore at the United States Government-owned Nicaro, Cuba, plant under a 2-year agreement with the General Services Administration. Efforts were directed toward recovering byproduct cobalt, chromium, and iron.

Light Metals

Bureau research has shown that aluminum-silicon alloys can be obtained by electrically smelting offgrade domestic materials not now suitable for alumina production and that commercially pure aluminum can be obtained from them in the laboratory. Operating variables were studied, and the equipment was altered to improve quality and to increase yield.

Laboratory tests yielded basic information for improving methods of producing alumina from Wyoming anorthosite by the lime-soda sinter process. The effect on alumina recovery of varying feed composition and operating conditions was studied intensively.

As research progressed on developing new magnesium alloys, the Bureau also provided fundamental information which encouraged greater use of this lightest of structural metals in aircraft, other transportation equipment, and industrial machinery.

Electrolytic purification of titanium scrap and offgrade sponge indicated that titanium can be eletrorefined to remove virtually all of the iron, oxygen, tin, nitrogen, molybdenum, and zirconium and most of the aluminum and chromium. The Bureau also continued to investigate the sodium reduction of titanium tetrachloride for producing high-purity metal.

Under a cooperative agreement with the Wah Chang Corp., extended to June 1957, the Bureau continued to improve titanium-sponge production techniques by the magnesium-reduction process. Innovations have created sponge of higher and more uniform quality.

After entering into a cooperative agreement with the General Services Administration for utilizing domestic ilmenites for titanium, the Bureau conducted smelting runs at the Albany, Oreg., station producing slag containing 70 to 98 percent equivalent titanium dioxide from Idaho, Florida, and South Carolina ilmenites. At the Boulder City, Nev., station, some of this was treated to produce titanium tetrachloride suitable for metal production.

Various factors in casting titanium were evaluated at Albany, Oreg., a 150-pound furnace being used to determine optimum mold materials, methods for utilizing scrap, and techniques for semicontinuous casting. Two small casting furnaces were designed and built for the Naval Research Laboratory and Army Ordnance.

Rare and Precious Metals

Idaho and South Carolina placer deposits identified during the Bureau's search for uranium and thorium for the Atomic Energy Commission were exploited by industry on a substantial scale. During the year the Bureau, under a contract with AEC, analyzed more than 24,000 mineral samples submitted by the public and believed possibly to contain fissionable elements.

By the end of the year the Bureau had turned over to industry the facilities for producing reactor-grade zirconium at the Bureau's Northwest Electrodevelopment Laboratory, Albany, Oreg., with the Bureau recovering hafnium metal from a chemical byproduct. Both metals were required by the AEC. In its own laboratories the Bureau continued efforts to improve zirconium-hafnium production techniques.

Under other agreements with the AEC, the Bureau conducted research on thorium-metal technology, the preparation and properties of rare-earth-metal alloys, and the beneficiation and hydrometallurgy of uranium ores, including uraniferous lignites.

On a laboratory scale the Bureau developed a flotation process that promises a commercial method for recovering beryl from pegmatite ores of Kings Mountain, N. C. Success of the Bureau in recovering columbium and tantalum from tin slags and domestic ores led a private company to build a pilot plant for treating columbium-tantalum concentrates.

Cooperating with the General Services Administration, the Bureau stepped up its program on selenium, a scarce strategic metal, seeking ores intensively in many Western States. On a laboratory scale, seleniferous ores from Wyoming and the Colorado Plateau as well as various smelter byproducts were processed for selenium values.

Research on rare-earth metals at the Bureau's Reno, Nev., station, was expanded; accomplishments included development of new instrument-analysis techniques for rapid and reliable determination of the rare-earth elements and progress in developing extraction and refining processes for producing the rare earths in pure forms.

Miscellaneous Research on Minerals

Besides surveying mining methods and costs in cooperation with industry, the Bureau continued studies of the mathematical principles governing sampling of mineral deposits, drilling research, and laboratory analyses of the physical properties of mine rock to reduce the amount of work necessary to establish mineral reserves. Design, construction, and use of instruments to measure physical properties and reactions to stresses generated by mining continued. Field work intended to utilize fully developed instruments and to test and improve others included investigations of blasting, mining in various types of rock, and roof support.

Determination of thermodynamic constants needed by metallurgists and others engaged in applied research continued, as did other basic studies on theories and formulas governing thickening, sedimentation, flocculation, analysis, electrostatic separation, flotation, ultrasonics, and development of synthetic materials.

Work conducted in cooperation with universities included a continuing study of drilling and new investigations on hydraulically placed mine fill and the use of precast concrete members for underground support.

BITUMINOUS-COAL RESEARCH AND RELATED ACTIVITIES

The continuous rise in bituminous-coal production since 1954 and the expectation that increasing demands for energy will cause this trend to continue and even accelerate strongly influenced the Bureau's efforts to promote conservation of coal resources. Statistical and economic studies were continued along with evaluation of foreign and domestic research programs.

Technologic Research

An outstanding development was a survey of coal research possibilities, which was made in cooperation with Bituminous Coal Research, Inc. This widely publicized study, outlining more than 200 projects, will help in establishing a comprehensive research program for coal technology in which all interested agencies, public and private, can participate.

Additional knowledge of the structure and constitution of coal was accumulated through research involving degradation, analysis, and physical measurements. Methods of coal classification and moisture determination proposed by the International Standards Organization and the Economic Commission for Europe were evaluated. In Alaska, the Bureau's coal work included exploration of coal areas and the establishment of a permanent testing laboratory. In the United States, methods and equipment used in coal mining were appraised, including modified longwall mining with German planers, and the use of large augers in surface operations.

In associated fields, the Bureau continued search for more effective methods for cleaning, dewatering, transporting and utilizing coal, developing test equipment, instrumentation, and techniques as necessary. Basic principles of flotation and modern feldspar jig cleaning of fine coal were among processes studied.

Continuing studies in the mechanism and kinetics of coal carbonization included investigation of the effects of pretreatment. In the Bureau's pilot-scale retort carbonizer, 31 eastern coals or blends not now widely used for producing metallurgical coke were carbonized experimentally. Cooperative studies with western steel companies were aimed at improving coke made from locally available coals. Studies were also made of the effects of blending inerts such as anthracite fines and petroleum coke on the quality of coke produced.

Besides helping other Federal agencies solve combustion and boiler-water treatment problems, the Bureau began a new fluid dynamics research project; flow patterns of gases and dusts in combustion equipment and pneumatic transport of solids were the initial phases studied.

Several problems of incinerating radioactive wastes were undertaken and a special incinerator was designed. As part of an effort to prevent or extinguish refuse fires, the effect of composition on the rate of spontaneous heating of coal-mine refuse was examined.

Fluid Fuels From Coal

Coal-to-oil research included additional fundamental studies of the chemistry of coal. Bench-scale and pilot-plant experimentation continued in an effort to improve synthetic liquid fuels processes.

The hot-carbonate technique for purifying synthesis gas was found superior. Fundamentals of the Fischer-Tropsch synthesis were restudied and catalysts that give high-quality gasoline and high yields of gasoline were evaluated. Efforts to engineer a one-step coal hydrogenation process have shown that temperature-control will be a difficult problem. Dry coal hydrogenation through stepwise heating of the coal was examined and appears promising.

Both synthesis and pipeline gases were involved in the coal-to-gas research. Work on synthesis gas was directed toward lowering costs by devising processes that either do not require relatively pure oxygen or will permit cheaper separation of oxygen from air. Pilot-scale runs on a process for making synthesis or pipeline gas from producer gas and steam, using a form of iron as a catalyst, were started. Studies were made on costs and materials of construction for use of nuclear energy in coal gasification. Tests were run in two simulated (electrically heated) reactors, and these indicated possibilities of reducing costs.

Laboratory studies were made of gasification of water slurries of low-rank, highly reactive coals. Development continued on a pulverized coal-oxygen pressure gasifier, and several feeding systems were evaluated. Kinetics of gasification reactions and behavior of gas-solids systems likewise were investigated.

The study of underground gasification of coal progressed in cooperation with the Alabama Power Co. and the Standard Oil and Gas Co., and an industry advisory committee was established. Work during the year was concerned with preparing a satisfactory gasification zone in a hydraulically fractured coal bed.

Bituminous-coal Economics and Statistics

Bituminous-coal production rose steadily during the year in response to demands by electric utilities, coke plants, and the export market. Forecasts that the trend would continue upward to unprecedented heights in the next two decades naturally caused attention to focus on how the producing industry will prepare to meet these anticipated requirements.

As an economic guide to technologic research, estimates were made of future energy requirements by each major energy consumer group.

Statistical and economic research increased in volume and scope to determine the factors that will govern the amounts of solid fuels and methods of production, distribution, and consumption of coal, its exportation, and its relative position in competitive energy markets. Special analyses were made of solid fuels mobilization requirements, particularly in relation to production of steel and other strategic commodities. Data on coal, coke, coal chemicals, foreign solid fuels, and energy trends were supplied to various members and committees of the Congress, to Federal and State agencies, and to others.

ANTHRACITE ACTIVITIES

Anthracite Research

Preliminary tests with a Bureau-designed pneumatic coal planer were completed in November 1955 after demonstrating that the hardest anthracite can be planed. Use of this device under production conditions is planned for the coming year.

Test data indicated the practical value in anthracite mining of backfilling chambers with a pneumatic machine preparatory to recovering pillars of coal. The packing rate that a fully mechanized operation would require for backfilling is within the range of the results obtained in the experiment.

In studies in the Bureau's experimental blast furnace at Pittsburgh, Pa., anthracite was substituted satisfactorily for up to 40 percent of the coke required for smelting untreated Mesabi iron ore and up to 60 percent for smelting prepared ore. When pellets were smelted, use of anthracite as part of the charge lowered fuel requirements and increased production at a constant blowing rate. The resulting metal was slightly lower in sulfur when anthracite was used, even though the anthracite was slightly higher in sulfur than the coke it replaced. Egg and Stove sizes of anthracite performed equally well.

Research on producing metallurgical fuel with anthracite as its principal ingredient indicated that after calcination (a form of heat treatment) a briquet made in the laboratory resists impact and abrasion as well as either furnace or foundry coke. Coal tar, petroleum pitches, and bituminous coal were studied as binders for anthracite and various briquetting devices and treatment temperatures were investigated.

Calcination studies of lump anthracite aimed at making it more suitable for metallurgical use indicated the possibility of improving its physical properties. Products containing less than 0.1 percent volatile matter were prepared readily in pilot-scale equipment.

Breakers in the Pennsylvania anthracite region were sampled, at the operators' request, and analyses of current production were made.

Anthracite Flood Control

A Branch of Mine Drainage was established at the Bureau's Anthracite Experiment Station, Schuylkill Haven, Pa., late in 1955. Its chief function is to review and evaluate mine-drainage projects proposed by the Commonwealth of Pennsylvania under Public Law 162, 84th Congress, which authorized Federal contributions up to $8.5 million to match the State's expenditures for such projects.

Data on mine-water pools, barrier pillars, and surface-water seepage previously compiled by the Bureau were brought up to date. Several projects were evaluated jointly with engineers of the Pennsylvania Department of Mines and Mineral Industries and of anthracite operators.

Anthracite Economics and Statistics

Weekly, monthly, and annual reports on production and distribution of anthracite were issued, enabling operators and others to obtain clearer perspectives of the industry's many economic problems.

PETROLEUM AND NATURAL GAS RESEARCH

Petroleum and Natural-gas Production

During the year, one Bureau of Mines report supplied answers to reservoir appraisal problems that have troubled petroleum engineers for years. Another, covering a study of gas-storage operations in a depleted oil reservoir, pointed the way to efficient secondary-recovery methods for deep-seated reservoirs and provided valuable information on pressure-maintenance by use of natural gas.

In a new field of research, the Bureau successfully applied and extended paper chromotographic methods to separate and study porphyrin aggregates isolated from crude oil; these substances cause production difficulties.

Certain phases of research on clays in petroleum reservoirs were completed and substantial advances were made in identifying clays. Progress also was made on other engineering studies of selected Arkansas, California, Kansas, Kentucky, Louisiana, Oklahoma, and Texas oilfields.

Progress was satisfactory in laboratory experiments to determine relative permeability of selected core samples and the stability and adsorptive characteristics of complex compounds of iridium 192, used to trace underground flow in secondary-recovery work. A study of electrical and surface forces in fluid flow was expanded to include reactive reservoir solids, such as clay minerals. Promising results were obtained in exploratory studies of the effects of detergent solutions on the resistance and permeability of an aluminum-oxide plug during oil displacement. Work on the effects of wettability on the permeability of inert porous plugs to homogeneous liquids was completed.

Experimental use of a foam detergent in the water-flooding of prepared oil-formation specimens progressed to the point where enlarged equipment is being adapted to further trials by the Bureau. Tests were completed on surface properties of a series of nonionic detergents and on the use of propane in isolating asphalt fractions rich in nitrogenous and interfacially active materials. Final results of a large-scale field test of detergents for water flooding in Oklahoma were published.

Thirty reports were completed on scientific and engineering research related to primary and secondary petroleum-recovery operations, Missouri River Basin studies, and a special natural gas pipeline survey for the Governor of Alaska.

Present and proposed Bureau petroleum-research projects were reevaluated in conjunction with a comprehensive survey of the industry's production-research program. A steering committee formed during the year suggested ways of using manpower and equipment more efficiently and closer coordination of Bureau research with that of industry.

Transportation and Storage

Field tests were conducted on 6 natural-gas underground reservoirs in studying the deliverability of gas from storage reservoirs. Investigation of the theory of transient pressure conditions within a natural-gas reservoir having been completed, the Bureau seeks to develop methods of predicting the productivity of natural-gas wells.

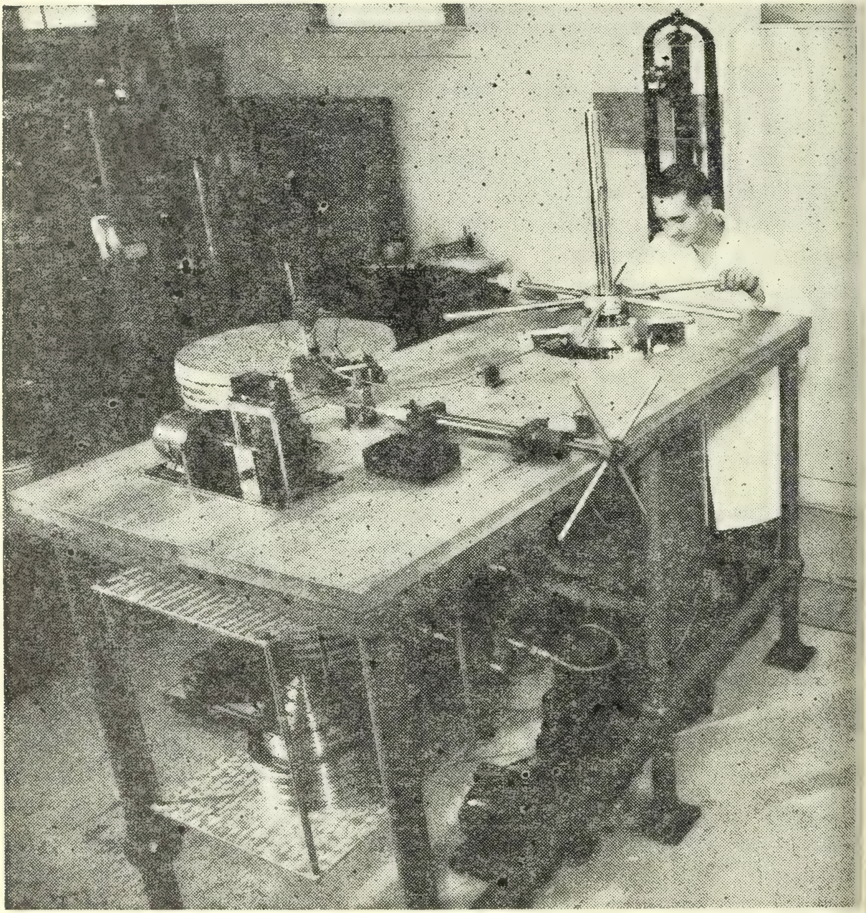
An engineering study of an underground natural-gas storage project in Illinois was reactivated, and staff members aided in formulating an American Standards Association safety code on gas-transmission and distribution systems and advised the United States Coast Guard in preparing standards for water transportation of liquefied natural gas.

Chemistry and Refining

As an aid to producers and consumers, the Bureau continued its research on autoignition characteristics of diesel fuels and pure hydrocarbons found in them. Based on analyses of heat transfer in the preignition phase of the diesel cycle, an equation was developed to define the rate of heat transfer in terms of combustion chamber conditions.

Analyses were made of 330 domestic and foreign crude oils, a gain of more than 50 percent over last year's total. A special report on the availability of specific fuels from various crudes was prepared for the Air Materiel Command.

A major development in the Bureau's survey of sulfur in petroleum was identification of thiophene in Wilmington, Calif., crude oil. In a related phase, adsorption techniques are being developed for concentrating and separating sulfur compounds from relatively high-boiling fractions of petroleum. Five standard reference samples of organic sulfur compounds were purified by Bureau technicians and prepared for distribution to other research groups.



Special compressibility apparatus in Bureau of Mines thermodynamics laboratory for determining pressure-volume-temperature relationships of petroleum components.

Satisfactory progress was counted in developing techniques for concentrating and separating nitrogen compounds from crude oil and studies are under way to determine the effects of thermal decomposition of such compounds in petroleum fractions. Three purified organic nitrogen compounds were prepared as reference standards

Emphasis in the Bureau's research on stability of distillate fuels shifted from study of storage characteristics to the basic causes of instability. As oxidation appears to be an important factor, the mechanisms involved are being studied. Samples were obtained for a stability research program on gasoline, and storage tests were begun.

Nationwide surveys were continued on the quality of domestic motor gasoline, aviation fuels and diesel fuels. In addition, burner fuels were included in the survey work for the first time.

Work in thermodynamics included precise measurement of such properties as heat capacity, heat of combustion, vapor pressure, and heat of vaporization for 19 organic sulfur, nitrogen, and fluorine compounds and for 9 hydrocarbons. Heats of combustion and formation were determined for tetraethyllead, solving a difficult problem of long standing. Complete thermodynamic functions were calculated for seven compounds for which measurements were completed. Distinctive recognition to the Bureau's petroleum research work came with the invitation to a staff member to present a paper, "Rotating Bomb Calorimetry," before the Faraday Society, Manchester, England.

In addition to many special reports to cooperators and supporting Government agencies, and several technical book chapters, 30 reports of the chemistry, refining and thermodynamics work were prepared for publication.

Petroleum and Natural Gas Economics

During the year the Bureau completely revised the old energy tables of mineral fuels covering production, and prepared new energy tables covering calculated consumption of all fossil fuels and waterpower.

In October the Bureau of the Budget requested a comprehensive study and review of all Bureau of Mines petroleum questionnaires to determine whether improvements might be made and if some forms could be eliminated. Several meetings were held; 14 agencies were represented at the first, members of the Statistical Committee of the American Petroleum Institute attended the second and agreed to establish regional committees to study the forms, and representatives of the American Gas Association attended another session.

Adoption of the following projects, recommended by representatives of other Government agencies and industry, will be contingent upon availability of funds:

1. Obtain better statistics on production with breakdowns by smaller areas than States, for instance counties.
2. Obtain more detailed data on interdistrict movement of crude oil and products.

3. Improve coverage of the report on refinery capacity and provide more data on miscellaneous petroleum products.

4. Explore the practicability of providing data, in future years, on petrochemicals and on exploration, discoveries, and development.

OIL SHALE STUDIES

Following the shutdown of retorting and refining experimental units, the Bureau's oil-shale program during the year was confined to mining investigations at Rifle, Colo., and research at the Petroleum and Oil-Shale Experiment Station at Laramie, Wyo. This work is described in detail in Bureau of Mines Report of Investigations 5237 (part II of the annual report of the Secretary of the Interior on operations under the Synthetic Liquid Fuels Act in 1955.)

Laboratory Research

Many samples of oil shale from the Tri-State region of Colorado, Utah, and New Mexico were analyzed by the Bureau and the results were used to extend known oil-shale reserves.

Chief emphasis in laboratory studies was on the fundamental constitution of kerogen, the organic material that yields the crude oil obtained by heating oil shale. Techniques used were solvent extraction, X-ray analysis, and spectroscopic examinations. Although additional evidence obtained by all these methods indicates that kerogen is extremely complex, the secret of its actual construction remains unsolved.

Studies on the composition of shale oil obtained at various temperatures in an entrained solids retort neared completion. Several autothermic runs of this retort were made during the year.

Mining

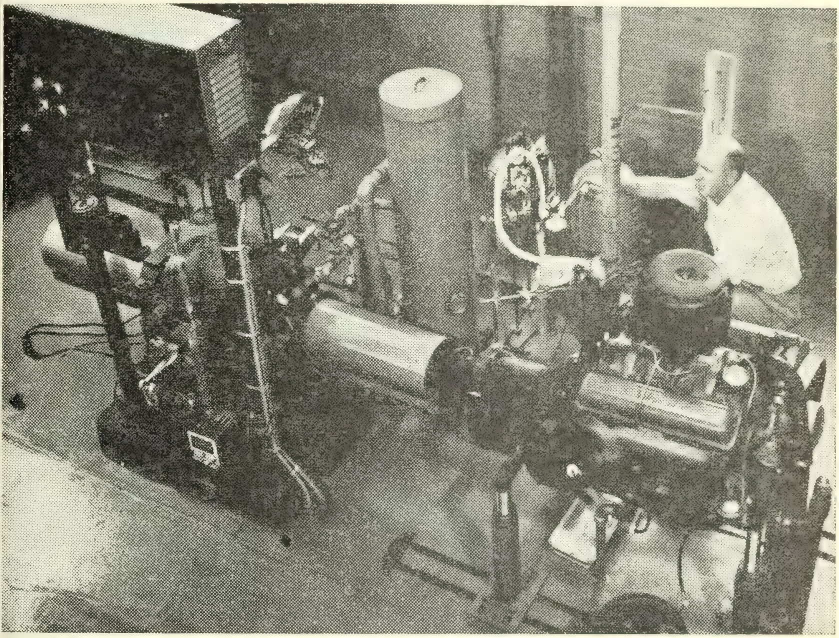
New mining equipment was received at Rifle, Colo., and additional miners were hired. Beginning in March, the mine was worked on a two-shift basis, but all such operations ended in June, since the Congress did not provide funds to continue operations.

Before work was halted, a new adit, known as No. 3, had advanced 343 feet with an estimated removal of 9,620 tons of shale. Another adit, No. 4, was enlarged for 532 feet with removal of 9,650 tons of material. In the mine portal and the two adits, 457 roof bolts and 782 feet of 4-inch channel iron were installed.

AIR AND STREAM POLLUTION STUDIES

The Public Health Service, United States Department of Health, Education, and Welfare, drew upon the Bureau's long experience and excellent laboratory facilities in connection with air-pollution activities authorized by the 84th Congress.

At the Petroleum Experiment Station, Bartlesville, Okla., research was begun on the role of internal combustion engine exhaust gases in air pollution. Exhaust gases produced under closely controlled conditions will be analyzed and the relationships of their components to fuel and lubricant composition and engine operation will be studied. Equipment for the first phase of this undertaking, including a V–8 automobile engine and a suitable dynamometer, was installed and tested.



Equipment used by Bureau of Mines to study automobile exhaust gases in air-pollution research program.

In a complementary phase of the work, the Coordinating Research Council is supporting Bureau research to determine the applicability of gas chromatography to exhaust-gas analysis.

Other aspects of air pollution being studied under the cooperative agreement with the Public Health Service are incineration of refuse, removal of sulfur dioxide from stack gases, and determination of effluents from stacks and vents of an industrial plant. Much of this work is being done at the Central Experiment Station, Pittsburgh, Pa.

Water pollution work during the year included surveys on losses of valuable minerals in industrial waste waters.

HELIUM ACTIVITIES

Helium production by the Bureau of Mines paced the Nation's rising industrial economy to reach a new peak of 243,790,000 cubic feet, 19 percent above the old record set the preceding year. A helium shortage that had developed near the end of fiscal year 1955 was largely overcome by September, enabling all essential demands to be met.

The largest single factor in the new production record was availability of helium-bearing gas from the Hogback field to supplement the supply at the Navajo plant, Shiprock, N. Mex. This additional source enabled the plant to produce at almost double its previous capacity. A smaller gain was achieved at the Otis, Kans., plant, where helium-bearing natural gas from the nearby Reichel pool became available.

Of great long-range importance were refinements in the helium production process, including newly designed heat exchangers and other equipment, and greater use of automatic valves and controls. These improvements were tested during the year and utilized to a limited extent to increase output. They will yield greater benefits in the future when they are installed throughout all plants.

Shipments during the year totalled 256,629,000 cubic feet, 12,839,000 cubic feet above production. The excess was made possible by withdrawal of stored helium from the Cliffside field, near Amarillo, Tex. This had been conserved in prior years when production had exceeded demand. Without the cushion provided by the conserved helium, the shortage early in the year could have become extremely critical, with adverse effects on the national defense and economy. Withdrawal continued only until the output of the plants increased.

Federal agencies received 73.5 percent of the helium shipped from the Bureau's plants, and private industry used an additional 14 percent on Government contracts, leaving 12.5 for private uses.

Plans to expand production facilities at the Exell, Tex., helium plant moved forward throughout the year. Congress previously had appropriated $6 million for the purpose. An architect-engineer contract was negotiated in August; plans and specifications suitable for use in requesting construction bids were approved at year's end. Meanwhile, the Bureau had ordered, through competitive bidding, an estimated $2 million in major equipment items for the expanded plant.

Transfer of the Navy's helium tank cars to the Bureau was effective July 1, 1955, whereupon the Bureau assumed full responsibility for operating the Government's helium tank-car pool. Seventeen new cars were added during the year, bringing the total to 107. The Navy relinquished its rights to recall 30,431 standard-type cylinders that it had sold to the Bureau earlier on a contingency basis.

A comprehensive report submitted by the Bureau to the Secretary of the Interior in December disclosed that helium is more vital to the national defense and economy than previously supposed, and that this valuable nonflammable gas will be required in growing volume to meet the country's future needs. The latest findings indicate that decisive additional conservation steps should be taken soon to save for future generations more of the helium now wasted in the large volumes of helium-bearing natural gas that are sold for heating and other purposes without going through a helium-recovery phase.

EXPLOSIVES AND EXPLOSIONS RESEARCH AND TESTING

Work on Explosives

Tests of permissible and other explosives and hazardous chemicals during the year totaled 3,037. Consumption of permissible explosives—those tested and approved by the Bureau for safe use in underground coal mines—rose to 90,338,390 pounds, compared with 78,490,751 pounds the preceding year; 180 different permissibles were on the active list at year's end. Field samples of 21 permissible explosives were tested and 2 were declared nonpermissible because of failure to meet minimum safety standards. The manufacturer was authorized to make certain minor compositional changes designed to make the product again meet required safety standards.

Two new blasting devices were approved for use in underground coal mines. During tests of a compressed-air coalbreaker for safe use in gassy mines, flammability of natural-gas air mixtures was determined at pressures up to 10,000 pounds per square inch. Sensitivity of a "do-it-yourself" type of ammonium nitrate explosive was determined; use of such explosives is growing in large-scale strip mining. Experimental quarry blasting with a nitrogen-tetroxide hydrocarbon liquid explosive disclosed serious inherent hazards.

Detonation-front temperatures in high explosives were measured. A small-scale study showed that humidity affects the incendivity of firedamp only to the extent that water vapor dilutes the oxygen in the gallery atmosphere. Other research was begun to determine whether the oxygen-value test, developed to evaluate the relative incendivity of high explosives, can be used to determine the relative safety of permissibles. High-speed photography was used to observe gaseous detonations at low pressures.

Dust and Gas Investigations

Besides evaluating the flammability of 76 industrial and mining dusts, measuring velocities of dust-explosion flames, and improving methods of quench-venting dust flames, Bureau researchers devised techniques for neutralizing the explosion hazard of parked mine cars loaded with fine coal. They also demonstrated that two 300-pound piles of coal dust can propagate on explosion in an otherwise well rock-dusted entry, and showed that blanket rock dusting on the mine floor alone is ineffective in controlling an explosion.

Flammable gases and liquids investigated to determine their explosive characteristics included hydraulic fluids for high-speed airplanes, synthesis gases used at low temperatures and high pressures, hydrogen, hydrogen-steam mixtures, a monopropellant, and various organic compounds. A study of the effects of pressure and airflows on the stability of laminar flames can be applied in designing commercial gas burners. Research on the chemistry of flames rich in combustible components was initiated, with special attention to their noxious products of combustion. Turbulent flames of natural gas and liquefied petroleum gases were studied with an electronic probe and a newly developed flame radiation photometer. Continuing research led to better understanding of electric spark ignition hazards in hospitals, industrial plants, and other establishments.

Large-scale coal-mine explosion demonstrations were held to emphasize the consequences of carelessness, and the Bureau aided Government agencies, municipal authorities, and industry in investigating and preventing fires and explosions.

HEALTH AND SAFETY ACTIVITIES

Activities to promote safety and healthful working conditions in the mineral industries were strengthened in fiscal year 1956, the first full year of operation under the immediate supervision of an Assistant Director.

More staff members were assigned to safety education and training, time-tested programs receiving increased emphasis. Other programs—research, equipment testing, and coal-mine inspection—were reviewed and modified as necessary to meet fast-changing conditions.

Besides investigating hazards that actually caused accidents, the Bureau studied latent dangers and sought ways of coping with them.

Through inspection of coal mines and enforcement of the Federal Coal Mine Safety Act, it continued to strive for improved safety conditions, and the year was free of major coal-mine disasters.

Work on Primary Hazards

With roof falls causing 58 percent of last year's coal-mine fatalities compared with 55 percent the preceding year, failure of the national campaign to reduce this type of accident was acknowledged and new attacks on roof-fall hazards were considered. Underground noncoal mines, on the other hand, experienced a drop of 29 percent in such fatalities. The improvement resulted largely from rock-bolting.

Bolting also continued to prove effective in controlling coal-mine roof. Of 229 roof-fall fatalities in bituminous-coal mines, only 5 were attributed to failure of bolted roof. This was 3 more than in 1954, but meanwhile the number of bolts used had increased from 2 million a month to 3 million.

In the laboratory and in the field, studies were carried on to determine basic principles of mine roof support and increase the effectiveness of roof-bolting. Included were efforts to systematize the use of compression pads, tests of new types of bolts, and centrifugal studies of rock specimens.

Throughout the year Bureau engineers held roof-control conferences with mining-company officials, State mine inspectors, and engineers from various parts of the United States and from foreign countries.

Testing Equipment

Broadening its program of testing electrical-mechanical equipment to determine suitability for safe use in underground coal mines, the Bureau developed standards for fire-resistant conveyor belts and for mine lighting systems. At the request of the Atomic Energy Commission and the Industrial Safety Equipment Association, the Bureau explored the feasibility of setting up laboratory facilities, training personnel, and preparing standards for approving respiratory protective devices for use in atmospheres contaminated by radioactive materials.

Ninety-eight approvals and 137 extensions were issued, requiring 1,756 explosion tests on equipment submitted by 26 manufacturers. Approvals were granted mining machines, a rock-duster, cable-reel shuttle cars, conveyors, trucks, compressors, pumps, roof drills, distribution boxes, loaders, a storage-battery locomotive, electric lamps, a flame safety lamp, a gas detector, a blasting unit, and two diesel tractors. Flame-resisting qualities of 7 cables were determined.

The Bureau's second experimental coal mine at Bruceton, Pa., near Pittsburgh, was completed; it consists of two entries to be used for testing dust-collecting units. Track was laid and ballasted, water and air lines were installed, and power lines were laid to the face area in conduit. Coal and other material removed during underground tests on a new explosive and a blasting device will result in development of additional entries which will be used later for safety examinations of drill-dust collectors and for other dust studies related to health rather than explosion hazards.

During the year, 9 rotary roof drills with integral dust collectors were approved and 8 extensions of approval were granted; this equipment was submitted by 4 manufacturers.

Six new approvals of respiratory protective equipment and 51 extensions of approval were granted during the year, and preliminary examinations were made on 6 devices. These included gas masks, supplied-air respirators, dispersoid respirators, and nonemergency gas respirators. Apparatus and techniques being developed for testing paint-spray respirators were improved.

Bothersome noises encountered in supplied-air helmets and hoods have led the Bureau to consider adding limitations on sound levels and frequencies to its approval schedules for such devices.

Health

The Bureau accelerated efforts to promote more healthful working conditions in the mineral industries during the year, expanding earlier programs and initiating new ones to meet hazards introduced by modern methods and processes.

Fortified by information gained in conferences with medical and research specialists in England, Wales, and Australia, the Bureau cooperated with the United States Public Health Service in planning a study of pulmonary disability among American coal miners.

In all, 19,714 gas samples were analyzed, including 19,041 taken during Federal coal-mine inspections. Others came from metal mines, sealed fire areas or boreholes into underground fire areas in coal mines, or tunnels under construction; some were collected in connection with testing and underground use of diesel engines or during plastics and conveyor belting decomposition tests, and the rest during tests of breathing apparatus and other protective equipment or miscellaneous field and laboratory investigations.

The Bureau installed equipment for measuring carbon monoxide concentrations in the Liberty vehicular tunnels at Pittsburgh, Pa. The information was used to appraise present conditions and aid in planning future ventilation changes.

Studies of possible dust hazards included the use of X-ray diffraction equipment to analyze 55 samples from various sources for free silica content. The light-field microscopic technique was used for dust counts on 671 impinger samples collected during field and laboratory investigations, and 106 particle-size distribution determinations were completed.

During the year, 30 persons, mostly from foreign countries, were trained to sample and evaluate airborne dusts.

An investigation begun in April 1955 to ascertain the effectiveness of bleeder entries in keeping caved areas in coal mines free of explosive gas accumulations was completed.

A complete ventilation survey was made of one coal mine, and a pressure survey was made in one of the Nation's biggest coal mines. This information, along with that assembled by the company in quantity surveys, was used on the Bureau's electric analog computer to forecast the effect of proposed changes in a ventilating system. The analog was used, also, to evaluate data submitted by Bureau engineers and to predict the effect of proposed ventilating changes in two western mines.

Field investigations were conducted to determine the composition of diesel exhaust gases and their influence on the atmospheres in potash mines, a copper mine, a phosphate mine, and a trona mine.

Future programs will emphasize studies on controlling dust potentially harmful to mine workers' health. These investigations should be broad enough to be useful throughout the industry. Examples of desirable studies are determination of the type of airflow—whether turbulent or streamline—and resistance factors for typical stoppings, overcasts, and extensive gob areas, and evaluation of noise levels in mining operations.

Accident Analysis

Analysis and tabulation of injury and related employment records remained useful as a guide for developing better programs to prevent accidents in the mineral industries. Besides reports for the industries, State and Federal agencies, trade associations, labor unions, and others interested, special tabulations were prepared to help the Federal coal-mine inspectors work more efficiently.

Industries covered included coal mining, coke, quarrying, metal and nonmetallic mineral mining, metallurgical operations, and petroleum and natural gas production and refining. Use of a revised reporting form developed during the year will enable the Bureau for the first time to classify and tabulate causes of injuries in the metallic and nonmetallic mineral mining industries.

The 31st National Safety Competition and 4 other safety contests were conducted with approximately 1,500 mines, quarries, and plants participating. Some 2,000 Certificates of Accomplishment in Safety were presented workmen and supervisors at the winning plants.

Safety Education

Safety training was intensified by the Bureau last year, particularly in the coal-mining industry, and still further emphasis is planned. Experience has shown the value of this work in reducing accident rates, partly by promoting safety consciousness but even more by giving officials and workmen the advantage of research findings on hazards and means of guarding against them.

In round numbers, 25,000 persons completed the Bureau's 20-hour accident-prevention course for coal miners, bringing the number trained since 1947 to 150,000. Since experience has shown the greatest improvement in accident rates at mines where every official and workman has taken this course, emphasis on 100 percent participation was intensified.

Bureau personnel continued to give similar training at mines and plants in other branches of the mineral industries.

By the end of the year 1,876,000 persons had taken the Bureau's first-aid course, 107,400 had taken its mine rescue course, and 38,000 had taken both since July 1910. The Bureau stimulates interest in these activities by sponsoring and contributing judges and other officials to local, State, and national contests and by sponsoring the Holmes Safety Association, a national organization whose local councils and chapters provide excellent forums for discussing the causes of accidents and means of preventing recurrences.

Coal-mine Inspection

For the fourth full year, coal-mine inspection work was carried on under the Federal Coal Mine Safety Act. Besides title I, authorizing the Bureau to enter and inspect coal mines, report on hazards, and recommend (but not require) their correction, it includes in title II specific enforcement provisions designed to prevent explosions, fires, inundations, and man-trip or man-hoist accidents, in mines regularly employing 15 or more men underground.

The Nation had approximately 8,510 active coal mines in 1955, including 1,474 title II mines, 5,735 small title I underground mines, and 1,310 strip mines. At the end of fiscal year 1956, Bureau personnel assigned to coal-mine inspection and related duties included 245 coal-mine inspectors, 43 engineers, and 10 coal-mine electrical inspectors.

During the year 3,627 routine inspections were made of coal mines subject to title II, 43 of them jointly with State inspectors under State-Bureau cooperative agreements provided for in the act. In addition, 1,604 special inspections were made to determine whether previously cited violations of mandatory provisions had been abated.

Federal inspectors observed 9,147 violations of the mandatory provisions, many of which were corrected immediately and thus required no formal action. They issued 1,576 notices setting a reasonable time for abating dangers, 287 granting time extensions, and 1,550 certifying that dangers had been totally abated.

During the year 112 orders were issued requiring withdrawal of men from all or part of 63 mines, 57 orders at 38 mines because of imminent danger, and 55 at 25 mines because of failure to abate violations within a reasonable time; the Federal Coal Mine Safety Board of Review, an independent agency, annulled one of the 55. By comparison, 155 withdrawal orders were issued at 100 mines during the previous year.

Orders were issued classing as gassy 12 mines previously considered nongassy. The Director later annulled one and revised another to apply to only part of a mine. The Board of Review denied one appeal and issued an interlocutory order on another granting the operator time to meet certain conditions pending reconsideration of the appeal.

Federal inspectors and engineers also made 6,686 routine inspections of smaller title I mines (including 767 strip mines), 1,209 electrical, ventilation, dust, blasting, and related surveys, and 759 investigations of fatal and serious nonfatal accidents, mine fires, gas and dust ignitions, and miscellaneous conditions.

No major coal-mine disaster (one causing 5 or more deaths) occurred during the fiscal year. Preliminary reports showed 417 coal-mine fatalities in calendar year 1955 compared with 395 in 1954, but the fatality-frequency rate of 1.04 per million man-hours was unchanged. The preliminary fatality-frequency rate for the first 6 months of 1956 was 1.10.

Control of Fires in Inactive Coal Deposits

At the end of the fiscal year the Bureau had controlled or was combating 55 of the 192 known fires in coal deposits not now being mined, 32 on the public domain and 23 on private property. Coal reserves conserved under this program since the Congress first appropriated funds for it in fiscal year 1949 now total an estimated 250 million tons.

Four fire-control projects were completed, 3 on the public domain and 1 on private property, and work proceeded on 8 others.

Future plans include necessary maintenance work on completed projects and initiation of new ones in order of urgency and to the extent appropriations permit. The Government pays the full cost of controlling fires on Federal land and requires local contributions of half the cost of controlling those on private property.

FOREIGN ACTIVITIES

Throughout the year the Bureau centered its foreign activities on projects designed to assure a continued inflow of strategic and critical minerals to counteract domestic deficiencies. It collected and evaluated technical and economic information on mineral deposits abroad, their development, and their metallurgical problems, then made the facts widely available. In addition, it gave technical aid to underdeveloped countries and trained foreign specialists in its laboratories. These activities have helped increase investment by private American capital in developing foreign mineral resources.

Services to Government and Industry

Requests for information and advice on foreign mineral matters from Government agencies, numerous foreign governments, and industry kept increasing. Private requests came from industries planning investments in foreign mineral deposits, machinery and equipment manufacturers seeking new markets, and consulting firms alert to new opportunities.

American investment in development of mineral industries abroad has been expanding rapidly, notably in bauxite, copper, manganese, nickel, iron ore, rutile, and petroleum.

Technical Assistance

Under a continuing agreement with the International Cooperation Administration, Bureau engineers were assigned last year to 15 technical assistance projects in 13 countries—Afghanistan, Brazil, Colombia, Cuba, Egypt, India, Israel, Liberia, Mexico, Nepal, Pakistan, Peru, and the Republic of the Philippines. Among these were 3 in coal mining and technology, 5 in metal and nonmetal mining, 1 each in chemistry and chemical engineering, and 5 combination projects.

A new educational program utilizing Bureau motion pictures was begun, with films depicting safety practices and various mining and metallurgical operations being shown by Bureau engineers in 9 different countries. The films were screened 60 times before approximately 5,000 persons and were received enthusiastically.

Foreign Trainees

Training of mineral technologists from abroad continued in Bureau laboratories. Sixteen trainees from 9 foreign countries completed their assignments, and 11 others remained at year's end. Brazil, Colombia, Formosa, India, Indonesia, Mexico, Peru, Thailand, and the

Republic of the Philippines were represented. About 20 trainees are expected during the coming fiscal year. Subjects emphasized are fuel production and utilization, metallurgy, and health and safety practices, these being of major importance in the countries represented.

Direct Contracts With Foreign Governments

At times, contracting independently of the International Cooperation Administration, the Bureau provides foreign governments, companies, or institutions with services not available from private research or consulting organizations.

Under one such agreement last year, two Bureau engineers presented a safety demonstration program at a Safety Congress in Monterrey, Mexico. All costs were paid by the Instituto Technologico y de Estudio Superiores de Monterrey.

Under a similar contract, the North Central Experiment Station, Minneapolis, Minn., performed reducibility tests on iron ore from El Romeral mine, Chile, for and at the expense of Compania de Acero del Pacifico S. A. of Talcahuano, Chile.

An arrangement of this nature has been in effect with Petrobras (formerly the Brazilian National Petroleum Council) since 1950, under which the Bureau has applied experience gained in its domestic oil-shale program to development of Brazilian oil-shale reserves. This agreement, now dormant, runs until July 1, 1957.

RIVER BASIN ACTIVITIES

The increasing importance of water to the Nation's growth and development has accelerated activity and cooperation among Federal and State agencies in water conservation and development. Problems of the mineral industries relating to inundation, water supply, pollution, and water development are of increasing concern to the Bureau.

Special reports were prepared concerning the mineral industry in proposed Federal and non-Federal water development project areas. Three River Basin Compacts were studied as another cooperative service by the Bureau; they involved mineral engineering consultation and review while States and the Federal representatives were negotiating.

During the year, investigations and reviews of reports made for other Federal agencies included 30 for the Corps of Engineers, 34 for the Federal Power Commission, 2 for the Bureau of Indian Affairs, 2 for the Fish and Wildlife Service, 8 for the Bureau of Reclamation, and 30 for the Department of Agriculture.

Missouri Basin Project

Special funds are appropriated annually for the Missouri Basin program. The Bureau of Mines prepared seven technical reports for the Federal and State agencies involved, covering all phases of the mineral industry—in the fields of lignite, petroleum, natural gas, metals, and metallic and nonmetallic minerals. Five special mineral industry studies for areas where reservoirs are planned were made for the Bureau of Reclamation.

Research on lignite was pointed toward producing a tar with high byproduct values to make the remaining char cheap enough for use as fuel for electric power generation. Such power could be integrated with a basin's hydropower to make more firm energy available. Progress has been made in solving the problem of adequate, safe storage of lignite mined from the Garrison Dam site.

Metallic and nonmetallic mineral studies were primarily on industry feasibility, source investigation, and utilization. Of special concern to the Missouri Basin was work on aluminous shales, phosphates, raw materials for the chemical industry, limestone, gypsum, and light-weight aggregates. Mineral development of the Basin is an important element in the Basin's growing economy and Bureau of Mines research provides specific and urgently needed information on new mineral discoveries and new technologic development.

MINERAL ECONOMICS

Seeking a sound economic basis for the Federal Government's policy and actions in meeting mobilization requirements and fostering a healthy minerals industry, analyses of supplies and requirements of the strategic metals and minerals were made under both peacetime and wartime assumptions. Response of demand and supply to price changes over different periods was analyzed for each strategic commodity. The effects of such factors as gross national product, industrial production, substitution, and technologic developments were also considered in estimating supply and demand responses to possible, probable, or proposed price changes.

Proposed and potential assistance programs were evaluated and estimates made of their cost to taxpayers and consuming segments, together with their probable benefits to the mining industry, other mineral industries, and service industries. Their potential effects on the price and cost structure and on consumption patterns of each mineral were analyzed.

Studies of the strategic minerals, besides aiding the Department's mineral mobilization program, substantially increased information on economic relationships influencing the long-term welfare of the industries producing them. In addition, numerous quantitative studies were made of fuels supply, use, substitution, and competition.

Factors affecting the foreign supply and use of minerals were analyzed from both a mobilization and a long-run viewpoint. Trends of imports and exports, effects of tariffs on the flow of imports, and varied Government actions relating to international trade in minerals were under continuing analysis and review. Analyses were made of the role of foreign supply in both short-run and long-run resource base planning for individual minerals. Trade and tariff analyses were undertaken in connection with negotiations under the General Agreement on Trade and Tariffs and numerous tariff change proposals.

Interindustry research studies covering columbium-tantalum, zinc, and chromite were completed.

Continued studies of the effects of Federal and State taxation of minerals on the operation of the industry covered treatment of expenditures in various stages of the development of mineral properties, financial relationships between percentage depletion and loss carryover, the estimated impact of different percentages of depletion allowance on mineral production, exploration, and development. Accelerated tax amortization, as it affected the mineral industries, was analyzed as a guide for proposed changes in this Government program.

Special Statistical Surveys

By an agreement reached in December 1954, the Bureau of Mines and the Bureau of the Census jointly conducted the Census of Mineral Industries for 1954. The Bureau of Mines collected and reviewed Census reports received from mineral producers. The Bureau obtained from Census reports for 1954 covering information on production, stocks, and so forth of many minerals ordinarily collected by Mines in its own surveys. This minimized duplication of reporting by industry and is expected to make statistics published by the two agencies more nearly comparable. By the end of the fiscal year, collection and review had been completed except for reconciliation of final results.

At the request of the Office of Minerals Mobilization, the Bureau of Mines surveyed most of the domestic mining and minerals processing industries (other than fuels) to determine their steel, copper, and aluminum requirements for maintenance, repairs, and operating supplies. The survey, based on actual use of these materials during the first half of 1955, revealed substantial changes in requirements, particularly an increased use of alloy steels and aluminum, since the last similar survey during the Korean War.

PUBLIC REPORTS

Three of the many reports issued during the year to fulfill the Bureau's obligation to make its findings available to industry, research workers, educators, and others were particularly significant.

The authoritative Minerals Yearbook was issued in 3 volumes instead of 1, an innovation that permits better coverage. Principal emphasis was on area presentation and reviews of technologic progress. Volume I includes commodity reviews other than fuels, volume II fuels reports, and volume III area reports.

Bulletin 556, Mineral Facts and Problems, which provides basic information on 85 mineral commodities, was designed as a reference work for engineers, scientists, and administrators; revision at 5-year intervals is planned. It has been popularly labeled as a "One-Volume Encyclopedia of Minerals."

Information Circular 7754, Outlook and Research Possibilities for Bituminous Coal, prepared in cooperation with Bituminous Coal Research, reviews the current status of research in this field here and abroad, and lists 209 possible projects for consideration.

In all, 622 publications were prepared for printing or processing; they included 8 bulletins, 142 Minerals Yearbook chapters, 5 miners' circulars, 3 handbooks, 14 lists of publications or motion pictures, 119 reports of investigations, 36 information circulars, 263 journal articles and speeches, and 32 miscellaneous reports (including 2 cooperative monographs). Their preparation involved editing 24,750 pages of text and examining 2,425 illustrations. Many lengthy technical indexes were prepared.

Demand for films from the Bureau's free loan library of industry-sponsored technical-educational motion pictures continued to grow, particularly from schools in the 48 States, Alaska, and Hawaii. Showings totaled 214,847 and the films were seen by more than 66 million persons at group presentations or on noncommercial television programs, compared with approximately 57 million the previous year.

"Arizona and Its Natural Resources," one of the most popular films in the Bureau's library, was revised during the year. Two new films, "Idaho and Its Natural Resources" and "The Petrified River—the Story of Uranium," were nearing completion at year's end.

Although central distributing and maintenance facilities for the more than 6,000 film prints are maintained at Pittsburgh, Pa., some 200 educational institutions, public libraries, Armed Forces installations and school districts participate in the circulation of the motion pictures on a free, long-term loan agreement.

ADMINISTRATION SUMMARY

The Division of Solid Fuels was separated during fiscal year 1956 into a Division of Anthracite and a Division of Bituminous Coal to improve administration and provide better control of research programs.

An Office of Management Analysis was established in the Office of the Deputy Director. One of its responsibilities is to complete the Bureau manual of instruction. The Bureau of Mines has adopted the departmental manual numbering system and format to facilitate integration of departmental manual releases with subject material in the Bureau of Mines Manual. Information published in the Bureau Manual supplements that published in the Departmental Manual. Thirty-six releases have been issued within the organization, delegation, and administration series following adoption of the departmental manual system.

A program of training in research management was established under the Assistant Director—Programs. Four qualified technically trained men have completed the course.

Property

A significant accomplishment in property management was adoption of the machine records property accounting system by Region V, Pittsburgh, Pa. The new system contemplates establishing immediate responsibility for and positive control of all property within the region.

Continued efforts to reduce the Bureau motor-vehicle fleet resulted in a 7-percent decrease. Continuing reviews of nonexpendable property needs resulted in transfer of property with an acquisition cost of $129,400 to other agencies. Scrap sales totaled $44,740.

Property records of the Bureau of Mines as of June 30, 1956, showed accounts as follows:

Automotive equipment	$4,053,699.47
Canvas, composition, leather and rubber goods	21,535.47
Drafting and precision engineering instruments	122,933.70
Electrical equipment	541,573.15
Hardware	511,143.65
Household furnishings	136,461.76
Laboratory apparatus and appliances	7,925,958.04
Medical and surgical appliances	61,187.25
Office furniture, appliances and floor coverings	3,003,097.17
Photographic and projection apparatus	369,110.01
Power plant and general shop equipment	4,101,217.46
Real estate	30,521,326.75
Specialized equipment	6,389,004.58
Total	57,758,248.46

The Bureau expedited disposal of obsolete records and the transfer to Federal Records Centers of records that are to be preserved or stored. During the year, reference cards for the Washington general correspondence files dating from 1910, when the Bureau was organized, through 1946, were transferred to the National Archives and Records Service and the Federal Records Center, making 736 square feet of former storage space available for office uses. The Records Control Schedule requires breaking the general correspondence files of the Washington office annually and transferring them to the Federal Records Center in yearly blocks after 5 years, 1 year's files being transferred annually. Results of records retirement throughout the Bureau are reflected in savings of floor space and in the release of many filing cabinets and card cases for reuse.

Finance

During fiscal year 1956 two surveys were undertaken which, upon completion, will benefit the Bureau's financial operations.

One group made a survey of the accounting system to determine its efficiency relative to the Bureau's budgeting and programing process and to determine the need for redesigning the reporting processes for effective management.

Under the direction of the Deputy Director, a bureauwide study was made of practices at field installations in the use and cost of common services, such as shops, and the methods employed in distributing such expenses as well as administrative overhead.

The information gained should result in more uniform operations throughout the Bureau. This will assist in developing cost standards which will, in turn, permit better evaluation of research operations.

Funds available to the Bureau of Mines for the year, including direct appropriations, prior balances available, reimbursements, advances and transfers from other Government agencies, proceeds from helium operations, and contributions from non-Government sources, totaled $49,895,064. Of this, $31,942,256 was obligated, leaving an unobligated balance of $17,952,808. Approximately half this was represented by available-until-spent funds approved by Congress for the anthracite mine-drainage program. A recapitulation at the end of the following tabulation shows the approximate amounts and sources of the unobligated balances.

Funds available to the Bureau of Mines for fiscal year 1956, by source of funds

Direct appropriation	$29, 578, 000
Prior year balances available	8, 938, 410
Less transfers and returns	—1, 568, 586
Reimbursements from other Government agencies	245, 681
Advances and transfers from other Government agencies	6, 803, 838
Proceeds from helium operations	4, 938, 307
Contributions to trust funds from non-Government sources	959, 414
Total	49, 895, 064

Obligations incurred by the Bureau of Mines in the fiscal year 1956, by appropriation

Conservation and development of mineral resources	$14,541,794
Health and safety	5,251,214
Construction	2,497,901
General administrative expenses	1,024,622
Working funds (including consolidated and allocated)	4,615,876
Economic and technical assistance, defense support, Asia and Pacific, other than Formosa and associated States of Cambodia, Laos, and Vietnam, executive (transfer to Interior)	[1]—5,783
Economic and technical assistance, Near East and Africa, executive (transfer to Interior)	4,458
Mutual defense financing, defense support, finance and technical assistance, Europe, executive (transfer to Interior) April 4, 1948–54	30,000
Mutual defense financing, defense support, economic and technical assistance, Formosa and the associated States of Cambodia, Laos, and Vietnam, executive (transfer to Interior), April 3, 1948–54	[1]—247
Technical assistance to American Republics and non-self-governing territories of Western Hemisphere, executive (transfer to Interior)	461
Technical cooperation, general, executive (transfer to Interior)	57,197
Administrative expenses, section 411, Mutual Security Act, executive (transfer to Interior)	29,945
Technical Cooperation, general, executive (transfer to Interior)	318,890
Defense support, Asia (transfer to Interior), 1956	27,403
Southeast Asia and western Pacific, executive (transfer to Interior), 1955	700
Defense support, Near East, Africa, and South Asia, executive (transfer to Interior), 1955	17,116
Development and operation of helium properties	2,685,903
Contributed funds	844,806
Total obligations incurred	31,942,256

RECAPITULATION

Total funds available to Bureau of Mines	49,895,064
bligations incurred	31,942,256
Unobligated balance of funds	17,952,808
nthracite mine drainage	8,500,000
onstruction under 14X0954	3,668,660
onstruction for Army	2,040,746
Helium balance	2,252,404
alances available in fiscal year 1957	950,000
Balances under fiscal year funds not available	540,998
	17,952,808

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[1] Disbursement less than carryover obligation.

Personnel

Delegation of Authority.—Field appointment authorities of assistant directors and regional directors were increased to grade GS–13. Field classification authorities also were increased. Previously, these authorities were limited to grade GS–11 or lower.

Employee Safety.—Bureau motor vehicle regulations and instructions were developed and distributed. Assistance was given to the field in conducting safety programs through inspections, recommendations for improving procedures, and safety messages. The Bureau received the Department's Green Cross award for the greatest improvement in safety for the month of February.

Staffing.—Recruitment of professional and scientific personnel, student trainees, and student assistants was emphasized. Virtually all Bureau offices participated. A speech for delivery to high school students by professional and scientific employees was prepared to stimulate interest in science as a career. Descriptive material covering the major professional positions in the Bureau was written for use in a departmental recruiting pamphlet. To strengthen the Bureau's recruitment and placement program, policies and procedures were adopted which assure better planning of anticipated recruitments or reductions and likewise improve methods for considering employees for promotion and transfer.

Employee Relations.—The personnel office cooperated with the Office of the Secretary in drafting employee handbook material applicable to the Department as a whole. In addition, much of the preliminary work was completed for revising the Bureau Employees' Handbook. Exit interview instructions were rewritten. Field visits were made for evaluation and assistance in connection with employee awards and the employee relations program in general.

Employee Development.—Three employees from the field participated in the Department's management training program. On-the-job training, including student training, continued to be emphasized. Work was begun on a manual chapter on training and employee development.

Classification.—Desk audits, field surveys, and conferences and discussion with employees were continued to assure compliance with classification requirements. On-the-spot studies were conducted at seven field stations and assistance in connection with inspections and classification audits conducted by the Civil Service Commission was provided three regions and another field activity.

The reorganization involving the abolition of the Division of Solid Fuels and the establishment of the Divisions of Anthracite and Bituminous Coal required revision of job sheets, classification of new positions, and advisory and instructional services. A classification study was conducted in the Division of Minerals to delineate the professional from the nonprofessional technical work. This study and realignment of classifications will continue through part of next year. A study was made of the safety representative positions in the Bureau and an analysis of the classification characteristics of such positions was prepared as a basis, or standard, for future classification actions.

Program Evaluation.—A Bureau of Mines Program Evaluation Guide was developed and distributed.

Schedule and number of paid employees

	GS	Ungraded	Total
Departmental	594		594
Field	2,712	983	3,695
Total	3,306	983	4,289

Incentive Awards.—Increased activity and employee participation in the incentive awards program were reflected by the following:

Suggestions received during the year	497
Suggestions receiving awards	157
Total of cash awards granted for suggestions	$5,040
Suggestions resulting in estimated annual savings	56
Suggestions resulting in intangible savings	101
Total of estimated annual savings	$32,949
Awards based on superior performance	44
Total cash awards granted for superior performance	$9,015
Special acts or service awards	2
Total of cash awards granted for special acts or service	$400
Total honorary awards granted	45

OFFICE OF OIL AND GAS

Hugh A. Stewart, *Director*

ADVICE and assistance given to the executive and legislative branches of Government during the year contributed to Federal coordination of petroleum and gas policy and served to keep Government officials and the public apprised of the petroleum and gas situation. Administration of the Connally Act, liaison with industry, discharge of responsibilities under the Defense Production Act, Federal Civil Defense Act, and the Internal Revenue Code were also carried on during the fiscal year. Office of Oil and Gas activities and accomplishments follow:

SERVICE TO CONGRESS

Congressmen, representing 22 States, received information regarding petroleum, gas, and related matters. Testimony and voluminous data were presented to 14 different congressional committees for use in conduct of various investigations. The Office of Oil and Gas supplied the basis for the Department's position in reports to Congress on proposed legislation related to petroleum and gas.

COOPERATION FROM STATES

A noteworthy contribution was made by the Interstate Oil Compact Commission at the request of Government. IOCC completed a report on underground storage of liquid petroleum hydrocarbons in the United States. The Director of the Office of Oil and Gas officially represented the Department of the Interior at IOCC meetings, and the Federal Petroleum Board received cooperation from the State oil and gas regulatory agencies in daily contacts in administration of the Connally Act.

INDUSTRY COOPERATION

The Secretary of the Interior continued to maintain direct channels of communication with the petroleum and gas industries to obtain advice and information as needed and requested on national oil and gas matters and mobilization planning. The Military Petroleum Advisory Board, National Petroleum Council, Foreign Petroleum Supply Committee, and Gas Industry Advisory Council were used for this purpose. In participation at meetings of these industry advisory groups and direct contact with representatives in industry, the secretariat and Office of Oil and Gas officials kept the industries informed on oil and gas policies and developments affecting those industries.

VOLUNTARY AGREEMENT RELATING TO FOREIGN PETROLEUM SUPPLY

On May 8, 1956, the voluntary agreement relating to foreign petroleum supply was amended to incorporate changes with respect to operations of the Foreign Petroleum Supply Committee. The amendments were requested by the Attorney General to eliminate possible anticompetitive dangers following a review of all of the voluntary agreements in effect pursuant to requirements of the Congress incorporated in the Defense Production Act. The changes prescribe that the Foreign Petroleum Supply Committee and subcommittees be under Government chairmanship, that its staff be Government employees, and that the foreign petroleum information be gathered by Government. Heretofore there had been industry chairmanship, staffing, and collection of information. As a result of the changes in functioning of FPSC, the Office of Oil and Gas took over the work of completing two revised reports on pipeline systems, and terminal and storage facilities at deep-water ports of foreign countries.

PETROLEUM AND GAS IN CIVIL DEFENSE PLANNING

Petroleum and gas responsibilities delegated to the Secretary of the Interior by Federal Civil Defense Administration Delegation No. 3, dated August 13, 1955, were assigned to the Office of Oil and Gas. Under this authority OOG plans and directs Federal activities designed to procure, store, transport, and distribute adequate petroleum and gas supply to attacked areas and reception centers, consistent with the national emergency fuel program.

As the fiscal year ended, OOG had in final stages of completion a sampling of how the States were organizing to cope with emergency problems under nuclear attack conditions. The partial survey indicated that the Government needs to provide information as to Federal planning for guidance at the regional and local levels. The Office of Oil and Gas expects to disseminate information for that purpose.

NATIONAL DEFENSE EXECUTIVE RESERVE

Inasmuch as the Office of Oil and Gas has major petroleum and gas defense responsibilities, it has commenced planning for recruitment of an executive reserve of personnel to be trained to occupy full-time executive positions in the Federal Government in event of national emergency. Authority for this executive reserve program is section 710 (e) of the Defense Production Act, implemented by Executive Order 10660 of February 15, 1956, and Defense Mobilization Order I–21, dated February 23, 1956.

Technical staff members of the Office of Oil and Gas will be key personnel in the petroleum and gas executive reserve. The Secretary of the Interior, upon recommendation of the Director of the Office of Oil and Gas, will enlarge the reserve by appointment of competent and outstanding oil and gas experts selected through industry sources, such as the Military Petroleum Advisory Board, National Petroleum Council, Foreign Petroleum Supply Committee, and Gas Industry Advisory Council, and from the former Petroleum Administration for Defense and Petroleum Administration for War.

NATO PETROLEUM PLANNING COMMITTEE

Important discussions on petroleum mobilization readiness planning of NATO countries made it desirable for the Director of the Office of Oil and Gas to head the United States delegation to the meetings of the North Atlantic Treaty Organization Petroleum Planning Committee held at Paris, France, in June, and to take an active part in the proceedings. An assistant director of OOG participated in the committee's meetings in Europe during October 1955, March and June 1956.

INTERNATIONAL LABOR ORGANIZATION PETROLEUM COMMITTEE

Two Government officials were members of the United States delegation to the reconvened fifth session of the ILO Petroleum Committee, at Geneva, Switzerland. One of the delegates was the Director of the Office of Oil and Gas, who participated in plenary sittings held April 3–14, 1956.

INDUSTRIAL EXPANSION GOALS

Office of Oil and Gas reexamination of its programs and progress of industrial expansion in the petroleum and gas industries to meet mobilization objectives resulted in the Office of Defense Mobilization closing certain goals. This was done by issuance of Defense Mobilization Order VII–6, Supplement 3, dated September 29, 1955. The closed goals included No. 65c, natural gas liquids capacity; 65d, oil pipelines; 65e, oil storage facilities; and 171, expansion of pipeline capacity in the gas utilities industry.

At the same time, a new goal, No. 226, was established for oil and gas pipelines and petroleum storage facilities. It applies to oil and gas pipelines running directly to military or Atomic Energy Commission projects, and petroleum storage erected solely for military use.

Of two petroleum goals still open after September 1955, the Office of Oil and Gas studies indicated that the petroleum industry would attain an established goal of 9 million barrels a day domestic refining capacity by January 1, 1957. In view of industry's progress toward reaching this goal, upon recommendation of the Office of Oil and Gas, ODM closed goal 65b covering United States refining capacity on April 20, 1956.

When the fiscal year ended, studies were underway to determine whether the alkylate goal should be increased or closed because it appeared that sufficient applications for accelerated tax amortization had been received to oversubscribe alkylate goal 207.

Acting as technical adviser to the Business and Defense Services Administration of the Department of Commerce, advice was given with respect to approval or denial of accelerated tax amortization for goal 206 covering research and development laboratories related to the petroleum and gas industries.

USE OF INCENTIVE OF ACCELERATED TAX AMORTIZATION

During the fiscal year 1956, over two hundred applications for accelerated tax amortization were processed by the Office of Oil and Gas. The applications had been referred by the Office of Defense Mobilization for reports and recommendations as to whether projects should be granted or denied accelerated tax amortization under the petroleum and gas expansion goals. OOG analyzed and submitted numerous recommendations to ODM covering applications for time extensions and scope amendments.

ADVICE AND ASSISTANCE TO FEDERAL AGENCIES

Under the leadership of the Assistant Secretary (Mineral Resources) and the Director of the Office of Oil and Gas, almost every agency having responsibilities or interested in Federal oil and gas policy, operations, and matters related thereto were given advice and assistance as requested. A brief résumé of important items follows:

The Presidential Advisory Committee on Energy Supplies and Resources Policy made a report in February 1955, aimed at strengthening national defense, providing for orderly industrial growth, and assuring energy supplies for our expanding national economy and for any future emergency. The report provided that oil imports should not exceed significantly the relationship that these imports bore to United States crude oil production in 1954. The Assistant Secretary participated in Presidential Advisory Committee reviews and outlook regarding crude oil and residual fuel oil imports and sanctioned action of the Defense Mobilizer in the effort to secure voluntary reduction of oil imports to the prescribed formula. Voluntary compliance by the oil industry to reduce imports in accordance with the formula would obviate Government action by the Defense Mobilizer under Public Law 86 which requires that he report to the President when he finds that an article is being imported into the country in quantities that threaten to impair the national security. The Government's position regarding the oil imports situation was supported by facts developed by the Office of Oil and Gas.

Oil specialists of OOG have represented the Department of the Interior on various Department of Commerce committees engaged in fixing controls and quotas on exports of minerals, metals, and their products as necessary to our national security.

As the agency delegated petroleum and gas defense responsibilities under the Defense Production Act, the Office of Oil and Gas developed and evaluated voluminous data requisite to planning for partial and full mobilization, rendering advice to the Office of Defense Mobilization, Department of Defense, and other agencies having need for such information. This assignment included analyses and evaluations of the worldwide petroleum and gas supply and demand situation and forecasting of potential supply and demand under various emergency conditions and situations.

The Office of Oil and Gas participated in the interagency project of developing the President's report to the Congress concerning the Nation's rubber requirements and resources and the need, if any, for further research by the Government.

CONNALLY ACT ADMINISTRATION

The Office of Oil and Gas supervises the activities of the Federal Petroleum Board in the administration of the Connally Act, an act prohibiting interstate shipment of oil produced in violation of certain State oil and gas conservation laws and orders issued thereunder. The Board initiates and conducts investigations and holds hearings with respect to production and interstate shipment of such contraband oil with the view of supporting the oil and gas conservation policies of the respective States.

The Federal Petroleum Board is composed of a Chairman and two members, with headquarters office at Kilgore, Tex., and suboffices at Midland and Victoria, Tex., and Lafayette, La.

While the Connally Act is applicable wherever State laws limit the rate of production and prescribe conditions for producing and handling of oil, its chief application is in the States of Texas, Louisiana, and New Mexico, whose regulations prescribed under the act are actively enforced by the Board. So far as possible with the resources at its command, the Board also enforces the provisions of the act in other oil-producing States, particularly in Mississippi, Oklahoma, Arkansas, and Kansas. The State of Colorado duly adopted and passed article 6, Oil and Gas Conservation Act, as amended by 1955 legislation, which brings this State within the provisions of the Connally Act and subject to its applicable regulations.

Producers, refiners, transporters, and others handling oil products in a designated area are required to keep prescribed operating records and file monthly reports with the Board on approved forms. The designated area consists of 106 counties in the State of Texas, the counties of Lea and Eddy in the State of New Mexico, and the entire State of Louisiana.

From the designated area the Board regularly receives and processes each month approximately 8,205 monthly producer's reports, about 483 monthly pipeline reports, and 67 reports from processors and refiners. These reports cover operations in 2,998 separate oilfields and account for approximately 65.84 percent of the entire production in the States of Texas, Louisiana, and New Mexico, which is approximately 4,096,000 barrels daily.

During fiscal year 1956, nearly 3,000 leases were inspected, some 2,500 leases were visited, and 9 pipelines were checked. To accomplish this, 659 oilfields were visited and 808 investigations were conducted.

At the beginning of the fiscal year, 9 cases dealing with violations of the act were pending, 5 in investigative status, 1 pending review by the Board, 1 pending disposition by the United States attorneys, and 2 were under review by the Solicitor's office.

Six new investigations were started during the fiscal year. Nine cases were on the Board's docket at the close of the fiscal year, of which 3 were in the investigative stage, 2 under review in the Department of Justice, and 4 were pending disposition by the United States attorneys.

During the fiscal year, six cases were closed, all by successful prosecution in the Federal courts. As a result, $14,400 in fines were imposed and paid.

DEFENSE MINERALS EXPLORATION ADMINISTRATION

C. O. Mittendorf, *Administrator*

DURING the fiscal year 1956, the Defense Minerals Exploration Administration continued to conduct a program to encourage exploration for deposits of strategic and critical minerals in the United States, its Territories and possessions.

Pursuant to a delegation of authority from the Office of Defense Mobilization to the Secretary of the Interior, the Government provides assistance to private industry, through the DMEA participating in the costs of exploring for indicated or undeveloped sources of strategic and critical minerals. The extent of the Government's participation is 50 to 75 percent of the cost of exploration, depending upon the mineral or minerals being sought. Funds for the Government's share of the exploration costs are allocated from the borrowing authority under the Defense Production Act of 1950, as amended. In the opinion of the Government, if the exploration work has been successful in finding ore, a certification of discovery or development is issued, and the contribution made by the Government to the cost of the exploration work is repayable at a rate of 1½ to not more than 5 percent of the sales receipts for any ore produced until the amount of the Government's contribution is repaid, without interest, or until a specified time, usually 10 years has elapsed from the date of the contract.

Exploration projects are established under contracts between the Government and mine operators. These contracts are based upon sound engineering and geological principles, and require specified work to be performed within specified costs and during a fixed period of time.

The program is administered by the DMEA with a small Washington staff and five field auditors. Technical field services are provided through the cooperation of the Geological Survey and the Bureau of Mines. Participation in the program by private industry is widespread and includes individuals, partnerships, and corporate enterprises. The program is especially appealing to small business as evidenced by the large number of small mine operators participating.

The DMEA received 486 applications for aid in an exploration project during the fiscal year 1956, bringing the total number of applications received since the inception of the program in mid-1951 to 3,179. This total includes requests for aid on projects located in 43 States and Alaska. In the 12 month period ending June 30, 1956, 144 new contracts were executed, making a total of 911 contracts executed since the beginning of the program. These contracts are for projects in 32 States and Alaska, and as a group include a search for 28 different minerals and metals. At the start of the fiscal year 1956, 208 contracts were in force but this figure dropped to 198 at the end of the fiscal year. From the beginning of the program to date, 62 contracts have been canceled without any work having been performed on them, but only 2 of these 62 contracts were canceled in the past fiscal year. During the past 12 months, Government commitments on contracts amounted to $3,724,087. The total Government commitments during the life of the program now amount to $26,179,002. The total estimated cost of the work approved under the 144 new contracts executed during the fiscal year 1956, including industry participation, is $5,702,376, and for the 911 contracts executed to date, aggregates $42,597,236.

During the fiscal year 1956, 112 contracts under which actual work was performed, were terminated without certification of discovery or development. The cost of these 112 projects was originally estimated at $3,782,368, with the Government's participation set at $2,063,360, but the actual cost to the Government was only $1,164,375. At the end of the fiscal year, 651 contracts having a total project cost of $20,856,745 had been terminated without certification. The Government's share in the cost of these contracts was estimated at $13,137,618, of which only $9,021,969 was expended. Although a few of these terminated projects have found small quantities of ore, the amounts were not sufficient to justify their being certified. However, valuable geological information was obtained from all of these terminated projects.

The DMEA issued 45 certifications of discovery or development during the fiscal year 1956. The total project cost for these certifications was $3,992,756. The Government was committed to participate up to $2,432,214 on these projects, but only $1,813,603 was actually expended by the Government. As of June 30, 1956, the DMEA had certified 246 projects having an aggregate project cost of $13,131,462. Government participation in these contracts was set at $8,135,331, however, only $6,207,662 has been contributed by the Government to date since work on some of the terminated projects was completed at less cost than anticipated and the work on several of the other projects is still in progress. At the end of the fiscal year 1956, the Government had received repayments amounting to $1,347,434 in the form of royalties from 267 operators. This sum included repayments from 22 operators for the full amounts of the Government's participation in their projects, totaling $365,006.

The 246 certifications were on projects involving a search for antimony, asbestos, beryl, chromium, cobalt, columbium, copper, corundum, fluorspar, iron, lead, manganese, mercury, mica, monazite, nickel, rare earths, rutile, sulphur, talc, tantalum, tin, thorium, tungsten, uranium, and zinc. Forty-seven of the certified projects were in North Carolina; 35 in Colorado; 26 in Utah; 23 in Idaho; 14 in Arizona; 12 each in California, Montana, and Nevada; 10 in Washington; 9 in Wisconsin; 7 in South Dakota; 5 each in Alaska and Georgia; 3 each in Alabama, Illinois, New Mexico, Missouri, and Wyoming; 2 each in Arkansas, Vermont, and Virginia; and 1 each in Florida, Iowa, Maine, New Hampshire, New Jersey, Oregon, South Carolina, and Texas. Twenty of the 246 certified projects had not been completed by June 30, 1956. On a conservative basis, at prices in effect at the end of the fiscal year, the recoverable minerals and metals in the ores found on the 246 certified projects is estimated to have a gross value of approximately $275 million. Subsequent ore-showings on 44 other projects may lead to their eventual certification.

All applications for exploration projects are studied by technical experts. In the majority of cases a field examination of the property involved is made by a DMEA field team, comprising personnel of the Geological Survey and the Bureau of Mines. Based upon a study of all available information, including the results of the field examination, either a project is approved and a contract made or the application denied. As of June 30, 1956, 1,423 applications have been denied, 267 of them during the past fiscal year. A total of 563 applications have been withdrawn, but only 86 in the past 12 months.

During the fiscal year 1956, applications were received at a steady rate with a slight increase over the number received during the previous fiscal year. The largest number of applications received were for uranium projects, the second largest number were for mica projects, and the third largest number were for tungsten projects. A substantial increase in applications for zinc took place, principally for projects in the Appalachian area.

Auditing of contract expenditures and ore production royalties continued at a steady rate during the fiscal year 1956. As of June 30, 1956, the Contract Administration and Audit Division of the

DMEA had made a total of 828 audits covering Government disbursements of $12,375,576, on 706 projects. Of these, 178 audits covering Government disbursements of $2,572,084 were made on 152 projects during the past 12 months. Approximately 79 percent of the exploration program disbursements have been audited. In addition, 86 audits have been made on 74 projects for production purposes during the fiscal year 1956. These 86 audits covered sales of production totaling $7,229,791, on which royalties payable to the Government amounted to $351,121. To date, 178 production audits on 146 projects have been made involving ore shipments of $15,479,354 and royalties payable to the Government totaling $739,393.

In July 1955, the DMEA issued a revised booklet of questions and answers about the exploration program. In order to expedite the processing of uranium applications, the DMEA established a field office at Grand Junction, Colo., in August 1955. Royalty auditing procedures were issued in January 1956, and a new delegation of authority to the executive officers of the DMEA in the field was also issued in that month. In April 1956, the short form contract of the DMEA was revised and forms for the Field Teams' semiannual reports on certified projects were also revised. On May 29, 1956, the DMEA issued Amendment No. 3 to DMEA Order–1, amended. This amendment added the mineral selenium to the list of strategic and critical minerals eligible for 75 percent Government participation in an exploration project, pursuant to request from the Office of Defense Mobilization.

The cooperation of the Geological Survey and Bureau of Mines with the extensive participation of mine operators has resulted in making the program a success. Participation in the program by the large number of small operators is particularly significant. Approximately two-thirds of the contracts executed have been with individuals and partnerships. About one-half of all contracts call for total expenditures of $24,000 or less, and about one-third provide for expenditure of less than $3,000 of the operator's own funds. Under the program substantial quantities of strategic and critical minerals have been found. Although current production is small, the ultimate production from successful projects will be important to the Nation's economy and defense. Some ore deposits are being found that are uneconomic to mine at present market prices, but these deposits will be available if needed in times of emergency. The ore deposits found under the DMEA program are an important element of the Nation's mobilization base.

OFFICE OF MINERALS MOBILIZATION

Spencer S. Shannon, *Director*

THE Office of Minerals Mobilization was established in January 1955 to carry out the Secretary's responsibilities for national defense preparedness in metals, minerals and solid fuels. These responsibilities had been delegated to the Secretary by the Director of the Office of Defense Mobilization. As of July 1, 1955 the Office of Minerals Mobilization commenced operations on funds appropriated to it.

The principal activities of the Office during the year consisted of estimating the adequacy of supply of minerals and solid fuels in periods of national defense emergencies, recommending programs to assure adequate defense supply, and establishing standby and readiness programs that could be activated quickly in the event of a defense emergency.

With the technical assistance of the Bureau of Mines and Geological Survey, 19 comprehensive mobilization base evaluations, together with recommendations for establishing and maintaining an adequate national defense supply position for various metals and minerals were completed and submitted to the Office of Defense Mobilization. Some represented revisions of previous mobilization base evaluations and recommendations required by changed conditions. As of June 30, 1956, comprehensive evaluations and reviews of 25 materials were in progress. About 50 reports and program recommendations were prepared on various expansion goals and their relation to essential production bases. In addition, at the request of the ODM, numerous appraisals were supplied concerning the effects on these bases of new factors, such as technological developments and proposed changes in tariff rates. The adequacy of industrial capacity to produce coal and coke under mobilization conditions was maintained under constant review.

In the case of solid fuels the Office had the responsibility of evaluating and recommending on applications for certificates of necessity for accelerated tax amortization under the Internal Revenue Code and for loans under the Defense Production Act. Through June 1956 a total of 175 necessity certificates had been certified and 28 canceled with 147 still outstanding at a total value of $698,401,000. Of these 83 were for coke, 59 for metallurgical coal, 2 for coal in Alaska and 3 miscellaneous.

In carrying out its minerals mobilization responsibilities the Office established and maintained coordination with other Government agencies which plan and carry out programs directly or indirectly affecting minerals mobilization. Of particular note was the establishment of arrangements for cooperation with the Office of Defense Mobilization and the Department of Agriculture in connection with the surplus agricultural barter program. The Office also represents the Department of the Interior on the Interdepartmental Materials Advisory Committee which deals with stockpiling and related materials supply matters.

Activities with respect to readiness were designed to insure continuity of government and the production of basic metals, minerals and solid fuels under emergency conditions. As part of this programing, recruitment was started for the executive reserve with a view to having trained key personnel available for service immediately in the event of a national defense emergency.

A complete study was made of requirements of mines, mills, and smelters and the solid fuels industry for controlled materials (steel, copper, aluminum and nickel) for maintenance, repair and operating supplies. To obtain the basic data for these estimates for the minerals industry, a survey was undertaken and approximately 25,000 questionnaires were returned and tabulated. From these data estimates were prepared in accordance with overall economic and strategic criteria so that they could be consolidated by ODM with estimates of other industries under the defense materials system. Specific plans for Government and industry action under emergency conditions were developed. Drafts of the regulations and orders necessary to put the recommendations into effect were in preparation. Work was commenced on plans and programs for plant security and plant protection.

Under the delegation from the Federal Civil Defense Administration, the Office began programing to assure an adequate supply of solid fuels for attacked areas and reception centers. In connection with this responsibility, the Office selected personnel to be utilized in controlling production and distribution of solid fuels in an emergency. Steps were taken in collaboration with the regional headquarters of the FCDA to establish local solid fuels advisory committees in potential target areas to assist the State directors of Civil Defense in obtaining adequate quantities of solid fuels in an emergency. Personnel of the Office of Minerals Mobilization received indoctrination at the National Headquarters of the Federal Civil Defense Administration at Battle Creek, Mich.

During the year, 15 Industry Advisory Committees were appointed to facilitate cooperation between the Government and minerals producers to assure that the special conditions and requirements in each industry would be taken into account in mobilization supply programing and to facilitate common understanding and action by industry and Government with respect to readiness.

OFFICE OF GEOGRAPHY

Meredith F. Burrill, *Director*

THE Office of Geography was established to carry out the responsibilities of the Secretary of the Interior under the act of July 25, 1947, conjointly with the Board on Geographic Names. The Office performs the research and other staff functions relating to the standardization of geographic names for use by the Federal Government.

The work of the Office in 1956 was chiefly concerned with names in areas outside the continental United States, with special emphasis on Latin America, Antarctica, and Africa. Geographic and linguistic research led to the standardization of over 140,000 names, bringing the total of such names and variant cross-references to about 1,500,000. Over 400,000 names were edited on maps and in textual materials for correctness of form and spelling and accuracy of application, and more than 300,000 names were issued in gazetteers. (See the report of the Board on Geographic Names.) In addition over 16,000 telephone and mail inquiries were answered.

Substantial files of standardized names are now maintained for nearly all areas except the continental United States. New source materials and changing political and linguistic conditions make necessary a continuing review of policy and the addition of new information to the name files of many areas. This and the supplementation of files continues to utilize increasing proportions of the research effort of the Office.

BOARD ON GEOGRAPHIC NAMES

The Board on Geographic Names is an interdepartmental organization established by the act of July 25, 1947, for the purpose of standardizing geographic nomenclature for use by the Federal Government.

Its members represent the Departments of State, Army, Navy, Post Office, Interior, Agriculture, Commerce, and Air Force, and the Government Printing Office, the Library of Congress, and the Central Intelligence Agency. Dr. H. Thompson Straw, Department of the Air Force, was Chairman during the fiscal year 1956.

The Board and its committees met frequently to act on nomenclature policies, to approve names and to perform related functions. New policies were formulated and previous ones revised and extended.

A uniform system for the transliteration of Arabic, the BGN/PCGN system, was adopted jointly by the Board and the Permanent Committee on Geographical Names for British Official Use.

The Board's series of gazetteers of standard names for public sale by the Superintendent of Documents was extended as follows: No. 5, Hong Kong, Macao, Sinkiang, Taiwan, and Tibet; No. 6, Chile; No. 7, British West Indies and Bermuda; No. 8, Albania; No. 9, Burma; No. 10, British Borneo, Singapore, and Malaya; No. 11, Greece; No. 12, Japan; No. 13, Indonesia, Netherlands New Guinea, and Portuguese Timor; No. 14, Geographic Names of Antarctica; No. 15, Mexico; No. 16, British Honduras; No. 17, Rhodesia and Nyasaland; No. 18, Costa Rica; No. 19, Iran; No. 20, Angola; No. 21, Uruguay; and No. 22, China.

The volume of additional activity is reflected in the report of the Office of Geography.

Office of the Assistant Secretary
Public Land Management

Wesley A. D'Ewart, *Assistant Secretary*

THE Assistant Secretary for Public Land Management is responsible for the direction and supervision of the Bureau of Land Management, the Bureau of Indian Affairs, the National Park Service, the Fish and Wildlife Service, and the Office of Territories.

Significant achievements have been attained in each of the bureaus during the past year in a continued effort to provide the best service to the public.

The technology and skills developed by the Bureau of Land Management in evaluating various land uses and applying the principles of multiple land use, assure a well conceived and balanced program for the proper management and orderly lease or disposal of the public domain lands in the United States. Fundamental to these programs is completion of a project for modernizing the basic land records. With the aid of modern technology, wornout documents are being permanently preserved on microfilm and electronic tabulating cards to permit easy reference. Adequate cadastral surveys are essential to the successful management and conservation of the natural resources of the public lands. Surveys have been extended over areas valuable for minerals, including oil and gas in the Western States and in Alaska. Areas found suitable for homesites have been subdivided to accommodate demands of increasing populations. In the Pacific Coastal States, surveys have aided in the harvesting of timber, reforestation and other timber management activities.

A marked acceleration in the Bureau's activities in both the public domain and acquired lands of the United States, particularly with respect to uranium, contributed to the national economy and to national defense through the discovery and exploration of new sources of fissionable materials.

Under recently enacted Public Law 359, some 7,250,000 acres of public land which were withdrawn from mineral location under Federal power site reservations were opened to location. Adequate safeguards are provided for the protection of surface values which could be destroyed by unrestricted mining operations.

During fiscal year 1956, the Bureau of Indian Affairs placed increasing emphasis on educational and economical opportunities. Development of reservation resources was pressed forward through continued extension of Indian irrigation projects, further expansion of soil and moisture conservation work, and similar activities. During calendar year 1955, sales of Indian timber were sharply stepped up and produced about a third more income to the Indian owners than in the preceding year.

The Bureau also took steps to increase the opportunities for industrial employment of Indians in the vicinity of reservations. A program to foster and encourage the establishment of manufacturing or processing plants in these areas was set up, and numerous contracts were made with industrial firms throughout the country.

The most outstanding feature of the National Park System and the National Park Service during fiscal year 1956, was launching of the Mission 66 program, a 10 year conservation program of development and improvement to provide facilities for 80 million visitors by 1966—the golden anniversary of the establishment of the service.

In the past, National Park Service programs have been on a year-to-year basis. The Service now hopes to be able to proceed with development on a full scale, rather than a piecemeal basis. Not only will this make possible much more economical expenditure of construction funds but it will shorten the period of disruption, for each area being developed, with construction activities.

Much thought and effort is being given to better accommodations and facilities in a number of our national parks, as for example the recently launched new Canyon Village in Yellowstone National Park, and the extensive cabin development, with appurtenant facilities, which will serve campers and day visitors as well, at Colter Bay, in Grand Teton National Park.

A major accomplishment for the Office of Territories during fiscal year 1956 was the enactment of the Alaska Mental Health Enabling Act, as a result of which the mental health program in Alaska will now become a territorial responsibility.

Also due to the passage of the Federal Aid Highway Act of 1956, Alaska's road program, heretofore operated by the Office of Territories, is being transferred to the Bureau of Public Roads of the Department of Commerce. Henceforth, the Territory of Alaska, with respect to highway developments, will be treated far more as though it were a State than has been true in the past.

Advancements of considerable importance in local government, public health, and education have developed in the Trust Territory of the Pacific Islands and in American Samoa.

In American Samoa the most significant change has been a tripling of exports through the operation by private enterprise, with Government encouragement, of a large fish cannery.

During fiscal year 1956, the first commercial air service began operation to American Samoa and plans for a large airport were progressed which will make American Samoa an essential stop on major Pacific air routes.

Extensive construction for the improvement of highways, schools, telephone system and fresh water supply were undertaken during 1956 in the Virgin Islands. Also contract has been made to study the airport needs of the islands.

For the first time in the history of the Virgin Islands Corporation, a corporation responsible for aid in developing the economy of the islands, a profit in the production of sugarcane was attained. The production per acre was 36.52 tons—the highest on record. Under this Corporation, power operations have improved both in efficiency of service and income.

Agriculture progress on the islands include land clearance, improved livestock production, and forestation, all of which have contributed to the overall development of this territory.

The Fish and Wildlife Act of 1956 (Public Law 1024, 84th Cong.) provides for an Assistant Secretary for Fish and Wildlife, with the Service becoming the United States Fish and Wildlife Service, under a Commissioner of Fish and Wildlife, and consisting of two bureaus, the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife. Under this act, the new Service will provide the opportunity for added conservation of our fish and wildlife resources through expanded research and improved management of fish and wildlife resources.

During fiscal year 1956, the Service made substantial progress in its promotion of utilization and conservation, and operations were further decentralized to bring them closer to the particular areas they affect.

Considerable success was obtained in developing markets for the plentiful and underutilized fish of the Great Lakes, and a nationwide survey of the shrimp industry aimed at improving production, processing, and distribution of shrimp products was completed.

During the year the first U. S. standard of grade and condition for fishery products was established through the joint efforts of the fishing industry and the Government. The first standard has been applied to fish sticks. Development of standards for frozen fish blocks and for raw breaded shrimp is well advanced.

BUREAU OF INDIAN AFFAIRS

Glenn L. Emmons, *Commissioner*

WITH the responsibility for Indian health activities transferred to he United States Public Health Service, the Bureau of Indian Affairs in the fiscal year 1956 placed increasing emphasis on the other wo phases of the program originally announced by Commissioner Emmons in December 1953—education and economic opportunity.

The most striking progress in the educational field was achieved on the Navajo Reservation where enrollment of children in school ncreased nearly 7 percent over the preceding year and reached a record level of 25,287 students. This total included not only children enrolled in schools on the reservation but those in mission schools, public schools of the peripheral communities, and Federal boarding schools located throughout the Western States.

Another significant step in education was the initiation of a "pilot" program of adult education in five tribal areas. Under the readjustment or "termination" laws enacted in 1954, members of tribes such as the Menominee of Wisconsin and the Klamath of Oregon were afforded an opportunity for adult education and vocational training o prepare them for the assumption of full citizenship responsibilities which would come with the ending of Federal trusteeship. The new program, however, went beyond this and affected tribes not covered by such legislation. Its principal purpose was to provide English anguage skills for Indians who enjoyed little or no formal schooling n their youth.

On the economic side the progress was at least equally impressive. Development of reservation resources was pressed forward through continued extension of Indian irrigation projects, further expansion of soil and moisture conservation work, and other similar activities. Sales of Indian timber were sharply stepped up in the calendar year 955 and produced about a third more income to the Indian owners han in the preceding year. Combined Indian income from oil, gas, and other minerals reached an all-time high of more than $41 million.

In addition to this heightened activity in the resource field, the Bureau also took steps to increase the opportunities for industrial employment of Indians in the vicinity of reservations. A program to foster and encourage the establishment of manufacturing of processing plants in these areas was set up under the direction of an assistant to the Commissioner and numerous contacts were made with industrial firms throughout the country. By the end of the fiscal year, plants of this type were either established or definitely in process at Kingman, Ariz., near the Hualapai Reservation; at Cherokee N. C., near the Cherokee Reservation; and at Gallup, N. Mex., near the Navajo Reservation.

Meanwhile the Bureau continued its voluntary relocation program of financial help and community adjustment service for the benefit of Indians seeking employment opportunities away from the reservations. The number of individuals receiving such assistance increased to 5,316 as compared with 3,461 the preceding year. This included 1,051 family groups, 732 unattached men, and 373 unattached women For the fiscal year beginning July 1, 1956, funds available for relocation assistance were more than tripled to a level of approximately $3,500,000 and plans were made for a substantial expansion in the range of community adjustment services and in the staff both on the reservations and in the city offices.

At the five tribal areas covered by "termination" or readjustment laws enacted in 1954—Menominee of Wisconsin, Klamath of Oregon Uintah-Ouray of Utah, western Oregon, and the four Paiute bands of Utah—steady progress was made throughout the year in preparing for the "termination date" when the Indians will take over full responsibility for their own property without further Federal trusteeship. In the case of the western Oregon and Paiute groups, this date was scheduled for the late summer of 1956 and the preparations were well advanced at the end of the fiscal year.

At Klamath a contract was signed for a complete appraisal of the tribal property which is scheduled for completion in the spring of 1957. For both the Klamath and Menominee the termination is set for 1958. For the "mixed blood" people at Uintah-Ouray it is scheduled for 1961. Similar readjustment legislation affecting three tribal groups in northeastern Oklahoma—the Peoria, Wyandotte, and Ottawa—was introduced in the second session of the 84th Congress, with the approval of the tribes, and appeared most likely to be enacted before the end of the session.

NAVAJO-HOPI REHABILITATION

In fiscal 1956 the 10-year program authorized by the Navajo-Hopi Rehabilitation Act of 1950 passed beyond the halfway point and continued to produce benefits of fundamental value for members of the two tribal groups.

Education

The Long Range Act authorized a total of $25 million for the construction of schools and for other educational purposes. The allocation of $3,287,000 for education in fiscal year 1956 brought the total of long range funds provided in this category through the sixth year of the program to $24,200,800.

The new boarding school at Kayenta was completed and ready for use in the fall of 1955, built at a cost of $1,507,000, and accommodating 400 boarding and 80 day pupils.

In addition, the construction program for fiscal 1956 included the near completion of work on two dormitories in peripheral communities, the awarding of contracts on two others and the awarding of contracts on three school expansion projects. On the Hopi Reservation the program included good progress on a boarding school dormitory at Keams Canyon and several other school construction projects.

Cooperation between the Federal and State Governments has made possible the construction of 11 public schools on or near the Navajo Reservation with funds appropriated under Public Law 815, and serving approximately 2,500 Navajo students. Two large public-school facilities will open at Tuba City, Ariz., and Crownpoint, N. Mex., in the fall of 1956, serving 350 and 450 pupils respectively.

The past year has been marked by close cooperation in the planning and execution of the Navajo education program by the Navajo Tribe, the Bureau of Indian Affairs, the State department of public instruction, and the local county and municipal governments. The cooperative approach has borne fruit in the form of better understanding on the part of Navajo and surrounding non-Navajo people, and has resulted in the formulation of a basic Navajo education policy. The latter provides that:

1. School facilities will be provided on the reservation for beginners through age 12—or through grade 6.
2. Educational opportunities will be developed in public schools for children in grades 7 to 12.
3. Vocational education in off-reservation Federal boarding schools will continue for retarded Navajo children in the 13- to 18-year age group, as long as required.
4. Provision will continue to be made through the States for the education of mentally and physically handicapped Navajo children.
5. Navajo high-school graduates will be encouraged to pursue advanced training in keeping with their interests and capabilities.

As one aspect of the objective of providing schools for beginners through the sixth grade on the reservation, trailer schools will be converted to permanent day schools when, after a 2-year trial period, such conversion is proven to be feasible and desirable. However, it is not intended that permanent expansion on the reservation will exceed 12,000 spaces. If additional space is required beyond that maximum, it will be provided in the form of temporary facilities.

At the close of the school year in June 1956, the total enrollment was placed at 25,287 pupils in all types of schools, representing an increase of 1,608 over the 23,679 enrolled in the preceding school year. Of these, 1,302 were enrolled in public schools in 6 peripheral towns in the Bordertown Dormitory program.

Completion of the dormitory construction and school expansion summarized above will be reflected in an increase in school enrollment in the bordertowns to an anticipated 1,460 in the 1956–57 school year.

Hospital and Health Facilities

On July 1, 1955, the Public Health Service of the Department of Health, Education, and Welfare assumed the responsibility for Indian health. The Long Range Act authorized a total of $4,750,000 for implementation of the needed Reservation health program, of which $2,712,300 had been allocated in long-range funds prior to July 1, 1955. In 1956, a total of $5 million was made available to the Public Health Service for the construction of Indian health facilities, of which $2,037,700 was charged to the long-range program, thus completing the appropriation originally authorized in this category.

Irrigation Projects

Of the $9 million authorized for irrigation construction by the Long Range Act, a total of $3,332,275 has been appropriated thus far, of which $636,500 was allocated in fiscal year 1956.

A 1,200-acre tract on the south side of the San Juan River, known as the "Helium Unit" of the Hogback project has been completed. Construction of the main canal and laterals and subjugation of the land was carried out under contract and finished on October 12, 1955, at a cost of $206,149.32. The Navajo Tribe will participate with the Bureau in the operation of this tract as a training unit over the course of the next nine years, bearing the greater portion of the actual cost from annual tribal appropriations.

The Red Lake project, involving 949 acres of land, was completed in November 1955.

The feasibility report on the proposed Shiprock division of the Navajo project was completed in January 1955, and submitted to the Secretary of the Interior by joint memorandum of the Indian and Reclamation Bureaus on February 20, 1956.

The Navajo project was included as a participating project in Senate bill 500, authorizing the construction, operation, and maintenance of the Colorado River storage project and participating projects.

Roads and Trails

A total of $8,405,000 has been allocated thus far against the Long Range authorization of $20 million for road construction. Of the total made available to date, $1,700,913 was provided for road construction on the Navajo, and $320,000 for construction on the Hopi Reservation in fiscal year 1956.

The 1956 appropriation is being used to finance additional construction work on Route 3, including the surfacing of a 19.5 mile segment of road between Ganado and Sawmill Junction, and for the surfacing and grading of the Window Rock streets. Contract work on Route 1 between Shiprock and Tuba City consisted of 11.5 miles of gravel surface and 10.3 miles of grade from Shiprock west. Four bridges were constructed, 2 on Route 1 and 2 on Route 3. Four airstrips were constructed located at Tuba City, Crownpoint, Kayenta, and Chinle.

Soil and Moisture Conservation

Long-range allocations for soil and moisture conservation and range improvement work to date have totaled $3,263,430, of which $686,850 was provided in fiscal year 1956. The total authorization is $10,000,000.

The soil conservation program receives the close cooperation of the Navajo Tribe which, in fiscal year 1956, contributed $70,000 in tribally appropriated funds plus approximately $1 million worth of labor and materials contributed by individuals. During the same period $203,600 was contributed in the form of agricultural conservation and stabilization program funds, and $685,003, in federally appropriated money.

During the past year emphasis has been placed on the eradication of sagebrush and juniper as a major range improvement project. In the Jeddito area 7,660 acres were cleared during fiscal year 1956, bringing the total acreage cleared to 15,703 acres. The cleared rangeland showed a gain of 160 pounds of usable forage per acre over adjoining uncleared areas on the basis of random clippings made in the fall of 1955.

Range Water Development

The total allocation of long-range funds for range water development in fiscal year 1956 was $146,280, to which there was added $244,634 in regular funds.

Of the total, $134,634 was used for construction and $110,000 for operation and maintenance. Twenty-two wells were initially programed for construction in fiscal year 1956; however, due to total well depths involved, it was necessary to reduce the number of wells contracted to 18. The completion date of the fiscal year 1956 program will be September 1956, or sooner.

Of the $250,000 Tribal appropriation for the fiscal year 1956 well drilling program, $10,000 was transferred to the U. S. Geological Survey for feasibility studies and $10,000 was withdrawn for administrative expense. The remaining $230,000 was programed for the drilling of 18 wells, more or less. Contracts have been let for the drilling of 10 tribal wells and the contracts for 8 additional tribal wells are pending. The completion of the fiscal year 1956 tribal well-drilling program will probably fall in the first half of fiscal year 1957.

On the Hopi Reservation excellent progress was made on the long-range water development program. Five wells were drilled and four of these were equipped with windmills and are now in operation. Two charcos were also built as an integral part of that program. This water development program was approved by the council and all developments are in accordance with that program.

Development of Industrial and Business Enterprises

The Long Range Act authorized the appropriation of $1 million for the purpose in reference, of which $228,000 has been allocated thus far. In fiscal year 1956, $10,000 was provided to the Hopi but no funds in this category have been allocated to the Navajo in fiscal years 1955–56.

Having passed through a period when the major emphasis was placed on the development of small, local tribal enterprises or "home industries," the Navajo Tribe is presently interested in a program designed to attract established industries, capable of employing Navajo labor, to the reservation area. The tribal council has formally endorsed such a program and, on December 8, 1955, adopted a resolution appropriating $300,000 for implementation of the program. The money in reference may be used for the provision of plant facilities to industrial operators, for the training of Navajo workers, and for allied purposes.

The tribe has established a tribal office for industrial development and operations and has hired an industrial manager to carry forward the industrialization program as rapidly as possible.

PROGRAM DEVELOPMENT

Programing on a broad scale to accelerate the carrying out of Bureau objectives was initiated on April 12 in a memorandum to area lirectors and agency superintendents entitled, "Programing for Inlian Social and Economic Improvement." This memorandum stressed the need to come to grips with the basic long-range problems n each tribal situation which presently impede the betterment of the Indians' economic status and living standards, hamper the provision of full educational opportunities for their children, and obstruct the mprovement of their health conditions. Another objective that was stressed is the need to reach a common understanding and mutual agreement with Indian people upon the means and methods for their achieving the stage where they will have developed the self-reliance necessary to conduct their personal affairs with the same degree of ndependence as other American citizens.

More specifically, in cooperation with Indian people, local and State governmental units, the Bureau is seeking (1) to make a careful analysis of reservation populations, their probable increase, their needs, and their potentialities; (2) to accurately inventory physical resources and possibilities for their improvement for the purpose of determining the number of people for whom these resources can provide a decent living; (3) with the cooperation of the Public Health Service, to secure adequate health coverage to reduce wasted human resources; (4) to provide through local and State educational sysems, as well as directly through Bureau-operated programs, adequate education opportunities in basic and vocational fields benefiting beginners through adults; (5) specific training and guidance programs o develop greater self-reliance and to equip Indians to adjust to a competitive economic society; (6) improvement and conservation of physical resources; (7) development of supplementary sources of income through establishment of payrolls on or near reservations; (8) to advise Indians of the economic opportunities available to them and o give adequate assistance within the limits of available appropriaions to all desiring to seek these opportunities; (9) gradual assumpion of functions performed by the Bureau either by the Indians themelves or, as appropriate, by agencies of the local, State, or Federal Government.

Primary responsibility for programing is placed upon agency superintendents but assistance is to be given when possible by Bureau personnel from area and central offices.

PROGRESS UNDER READJUSTMENT LAWS

Alabama and Coushatta Indians of Texas

Fiscal year 1956 was the first in which the Alabama and Coushatta Tribes of Texas functioned wholly without Federal supervision. Although Federal trusteeship terminated on July 1, 1955, pursuant to Public Law 627, 83d Congress, approved August 23, 1954, these Indian people, if they desire, continue to be eligible to be admitted to hospitals and schools maintained by the United States on the same terms applicable to other Indians. During this year, five Alabama and Coushatta Indian students continued or completed their courses in Bureau educational institutions. Only seven members of the tribes found it necessary to call upon the Bureau hospitals for medical services, thus indicating self-reliance in all instances other than major or emergency illnesses. State officials report smooth and satisfactory transition to local auspices in the conduct of Alabama and Coushatta Indian affairs.

Menominee

The Menominee Act terminating the special Federal trusteeship (Public Law 399, 83d Cong.; 68 Stat. 250) was the first adopted but provided for the second longest transition period of the six laws removing restrictions enacted by the 83d Congress. During the first year of the transitional program (fiscal 1955), steps were taken to (1) determine entitlement to inclusion of members on a final roll of the tribe, (2) distribute $4,885,500 per capita to the Menominees as directed by the termination act, (3) arrange with the State of Wisconsin for a special adult education and vocational training program, (4) and carry out a far-reaching administrative and services reorganization resulting in the separation of the Agency and tribal governmental activities from the lumber milling and other commercial enterprises.

The many service functions heretofore administered by Agency personnel, and sometimes performed by Mill personnel, now devolve upon an enlarged tribal organization if it wishes to continue these services as tribal enterprises. The tribe has employed its own bonded treasurer, who, with the tribal chairman, supervises tribal business accounts and many of the activities formerly administered by the Agency under a new simplified plan of operations. Similarly, the Menominee Garment Factory, long a troublesome and losing operation as a tribal enterprise, has been leased to private operators in the textile field, with a prospect of guaranteed income to the tribe and continued employment for Menominee workers. The Bureau completed a management analysis of the Agency administration in July 1955, in which the Menominee Advisory Council concurred in the main, and the resultant adjustments find a very small Agency staff argely devoted to advisory and trust management activities, with the functional service-providing activities under the management of tribal government. For the balance of the transitional period it will be a "learn-by-doing" process for the Menominees, with counseling and general trust supervision as the role for the Bureau of Indian Affairs.

Klamath

Cooperatively, the Klamath Indians, and the Federal and State agencies concerned are directing their efforts toward accomplishing the various provisions of the act leading to termination on August 16, 1958. The proposed roll has been published and appeals, of which there are now approximately 50, are being considered by the Secretary. Management specialists under contract with the Secretary have (1) started a survey designed to develop guidelines for selectng economic units and to determine an equitable way of apportioning tribal assets among tribal members; (2) assisted in formulation of a plan to stimulate the tribal economy; (3) considered appropriate methods of managing the assets that would remain with the tribe; and (4) submitted a contract for appraisal and inventory of the reservation's resources that was approved by the Secretary February 17, 1956. Indians are reported to be showing a great deal of interest in an educational program under a contract with the Oregon State Department of Education for (1) off-reservation training which includes any regular college or training school chosen by the student applicant; and (2) on-reservation training centered around social, economic, and vocational training such as business management, insurance, and homemaking.

Western Oregon

The western Oregon Indians, under Public Law 588 progressed on schedule toward the termination date of August 13, 1956. For the Grand Ronde group, the final roll was completed and published, the tribe elected to dispose of all tribal lands excepting a small tract on which the community building is located, and land sales are moving forward to completion. For the Siletz Tribe, the tribal roll has been completed, 37 acres of federally owned land are in process of being transferred to the city of Siletz, the cemetery is being transferred to an Indian organization, work is underway to transfer 6 acres of federally owned land to the city of Empire, and the balance of the land is to be used as a park-monument to Siletz Indians. Preparation is also underway to process a per capita distribution of $500,000 to tribal members of which over $400,000 was derived from the sale of tribal lands.

Utes of Uintah and Ouray

Termination of Federal trusteeship for the mixed-blood group under Public Law 671 is scheduled for September 1, 1961. Final rolls have been published for both groups consisting of 1,314 full bloods and 490 mixed bloods. Both groups jointly are completing special purchase of heirship lands.

The mixed bloods adopted a plan for the distribution and management of assets, adopted a constitution and bylaws under the name of "Affiliated Ute Citizens of Utah" and elected a board of directors. The full bloods are processing a long-range program which is to include a family plan, resources development, credit, health and education—all designed for improving self-support and the management of their own affairs. Bills were introduced in the 84th Congress to permit future enrollment on the full-blood rolls prohibited by Public Law 671, and to exempt mixed-blood corporations organized to handle the distribution of assets from corporate income tax.

Paiute Bands of Utah

Federal trusteeship for the Paiute Bands of Utah under Public Law 762 is scheduled for termination September 1, 1956. Final rolls have been published for the four bands; Indian Peaks 26, Kanosh 42, Koosharem 34, and Shivwits 130. The Kanosh Band has elected to partition its land. The Indian Peaks and Koosharem Bands have tentatively elected to sell their lands. The Shivwits Band has indicated it will apply to the Secretary for his approval to sell 26,680 acres of its reservation and will retain 840 acres in trusteeship for a period of 10 years as homesites. Special recontact work is being carried out with these groups to advise them of the opportunities available to them under the vocational training and relocation programs which, if not begun by individuals, will expire on September 1, 1956.

INDUSTRIAL DEVELOPMENT

The Bureau's industrial development program was initiated early in the fiscal year 1956. Contacts were made by the Commissioner's assistant with numerous industries from New York to Los Angeles in the fields of electronics, textiles, metal fabrication, woodworking, and many others.

One tangible result of the program during the fiscal year was the establishment of a metal fabricating plant at Kingman, Ariz., in

January by the Kingman Industries, Inc. It is expected to employ at least 50 Indians, mainly from the Hualapai Reservation, by the end of the first year's operation.

Another development was the action of Saddlecraft, Inc., of Knoxville, Tenn., in setting up a plant for the manufacture of leather moccasins and other leather goods near the Cherokee Reservation in North Carolina. It is currently providing steady employment for 21 Cherokee workers.

Under the Navajo Tribe's program for attracting industry, a contract was consummated June 25, 1956, by the tribe with the Baby Line Furniture Corp. of Los Angeles, Calif., manufacturers of juvenile furniture, house shutters, play yards, and similar products. The contract provides for establishment of a branch plant at Gallup, N. Mex., which is scheduled to begin operations around October 1, 1956, and is expected to employ about 100 Navajo workers by the end of the first year. Further expansion of operations in the future is anticipated.

At the close of the period, additional negotiations were being actively carried forward by the Bureau with a number of industrial companies, looking toward the establishment of plants near Indian population centers in Oklahoma, Minnesota, North Dakota, South Dakota, Montana, and Wyoming, as well as Arizona and New Mexico.

EDUCATION

Approximately 122,900 Indian children of school age, 6 to 18 years, attended public, Federal, mission, and other schools in the United States and Alaska in the fiscal year 1956. Nearly 60 (58.6) percent were in public schools, more than 30 (32.3) percent in Federal schools, and 9 (9.1) percent in mission and other schools. Enrollment in public schools increased substantially while it remained stationary in Federal schools, due to the policy of transferring classes and schools from Federal to public school jurisdiction where feasible.

Contracts with States and local school districts were negotiated in 19 States and the Territory of Alaska, providing Federal financial assistance for public school education for approximately 39,600 Indian children, as authorized by the act of April 16, 1934 (48 Stat. 596), as amended, commonly known as the Johnson-O'Malley Act. The public schools absorbed an additional (estimated) 3,400 Indian students in the fiscal year 1956.

The State of Texas has assumed full responsibility for the education of Indian children within the State.

In accordance with the recommendations of the House Committee on Appropriations, dated March 15, 1955, H. Rept. 207, a survey was completed of the administration of the Bureau's program of financial assistance to public school districts as authorized by the Johnson-O'Malley Act. While the report pointed to certain shortcomings, which are now being corrected, it generally endorsed the policy and procedure of the Bureau in administration of this activity.

In cooperation with the Department of Health, Education, and Welfare and the local school districts in the States of Arizona, Colorado, Montana, and New Mexico, the Bureau has recommended the construction of new schools under the provisions of Title IV, Public Law 815, as amended. These projects will make it possible for additional Indian children to attend local public schools.

The Bureau of Indian Affairs operated 83 boarding and 234 day schools in the fiscal year 1956. Many of the reservation boarding schools accommodate large enrollments of day pupils. The day schools include 13 instructional aid schools in Alaska, and 29 trailer, 4 hogan, and 4 literacy units on the Navajo Reservation. Classes were also conducted for Indian children who are patients in four hospitals (sanatoria) and Indian students were housed in Federal dormitories at 11 locations to attend public schools.

Approximately 83 percent of students enrolled in Federal schools are full-blood Indians and only about 3 percent are less than half-blood.

A total of 25,287 Navajo students, all ages, were enrolled in all types of schools during the 1955–56 school year. This represents an increase of 6.8 percent over the previous year's enrollment. Due to an increased school population, the number of Navajo children out of school decreased only slightly despite the provision of additional school spaces.

Emphasis, the past year, has been placed on the review of standards now in effect and the development of new ones for the guidance of schools operated by the Bureau. The main objective of such a study was to develop a standard guide for school operation. The standards reviewed include (1) the curriculum and the techniques employed in developing it; (2) the vocational guidance program; (3) the staffing pattern necessary to operate a school at maximum efficiency; and (4) equipment and supplies needed for daily operation.

Professional growth has been an important part of the Bureau's summer education program; 38 workshops, on local and area level, have been held with approximately 3,000 persons participating. Themes for the workshops were developed around the needs of special groups. Some of the themes were: orientation and special training for new employees, curriculum study for both academic and vocational teachers, guidance for advisory personnel, preventative maintenance for custodial personnel, and better feeding program for cooks. Principals and principal-teachers of the Juneau area met for 2 weeks to discuss the educational program needed in Alaska to meet the rapid changes taking place in the cultural and economic lives of the natives and to clarify their responsibilities to the school and to the adults in the villages. Representatives from other Bureau branches, United States Public Health Service; and Territorial health, welfare, and education departments participated. Bureau education personnel planned and led these workshops and many people outside the Bureau participated. Several public school teachers facing the same problems enrolled. Representatives from State departments of education and health, and from universities and colleges participated.

Vocational training courses in printing were continued by the printing departments operated at five large boarding schools. In the 1955–56 school year 114 boys received training in these shops with 14 graduating. Of those graduating, 12 have received permanent placement in commercial printing establishments, 17 others are working in print shops for the summer.

The schools operated for the Choctaw Indians in Mississippi, for the first time, will have access to good library facilities through the Bureau's purchase of a mobile library unit to be ready for operation in the late fall of 1956. The unit will be equipped with approximately 4,000 books and with some visual aids equipment and supplies suitable for use with school age children. The initial evaluation of such a service was obtained through the excellent cooperation of the Mississippi State Library Association. It has been determined through use of the State library unit that a bookmobile library will be enthusiastically received and will be of great educational value to the Choctaw people.

During the year the Bureau initiated a pilot program in adult education. This program originated in the expressed need of individual adult Indians in many tribal groups to acquire the basic skills of speaking, reading, and writing the English language and doing simple arithmetic or to increase these skills. There are hundreds of adult Indians on reservations today who do not possess such skills, either because educational opportunity was not available to them when they were children or because they did not fully avail themselves of such opportunity as existed. In either case, many adults now feel a need for literacy skills to aid them in employment, buying and selling, maintaining good health, rearing a family, and assuming responsibilities of citizenship.

Operations of the program have been begun at five tribal jurisdictions where the need was especially acute: the Seminole of Florida, the Papago of Arizona, the Turtle Mountain Chippewa of North Dakota, the Rosebud Sioux of South Dakota, and the Shoshone-Bannock at Fort Hall in Idaho. Teachers have been employed at these jurisdictions and are surveying the educational needs and interests of the adults. Instruction based on this survey has begun at most of the jurisdictions.

A continuing search has been made for published learning materials which might be usable in the program. However, because of the peculiar needs of the learners involved, it has been and will continue to be necessary to prepare much of the instructional material specially by gearing it to the specific needs, interests, and levels of literacy of the learners. A good start has been made on preparing such materials.

A plan for evaluating the program has been devised. This involves complete documentation of the adults' needs and interests and the methods, techniques, materials, and equipment employed in teaching.

The Bureau's program of assistance to Indian young people in obtaining education beyond the high school level was accelerated by a larger appropriation in education grant funds for this purpose in 1956; 202 students were aided by the grant funds. A number of tribal groups have established scholarship grant programs from their own funds. The Jicarilla Apache Tribe of New Mexico will use the income from a $1 million trust fund, created in 1956, to provide higher education for its young people. The Bureau is continuing its work to increase the number of Indian scholarships now available through public and private sources and is using to the fullest extent the higher education benefits made possible through Federal grants, loans, working scholarships, and post high school vocational training courses.

WELFARE

In the field of welfare the Bureau continued its emphasis on providing social services to assist Indian families to manage their own affairs and cope with their personal problems, as well as maintaining an assistance program for needy Indians. Child welfare services have been provided for dependent or neglected Indian children either in their own homes or in foster homes when placement away from home has been indicated. There is increasing recognition of the need for such assistance. Some progress was made in finding, and referring for appropriate institutional care, Indian children with handicaps such as mental retardation, deafness, blindness, or cerebral palsy who require training which is not available in Bureau schools. Considerable unmet needs were uncovered in this connection, particularly in the Southwest.

Relief needs in Alaska and on the Navajo Reservation increased, while remaining fairly stable in the rest of the country. In Alaska the increase was considerable because of the poor fishing season, which resulted in a heavy caseload in areas where fishing is the chief means of support. The Public Health Service increased case-finding operations particularly with respect to tuberculosis in Alaska and on the Navajo Reservation, and it was necessary to provide assistance to a number of additional families either in the family home or with foster care of the children when the parents were hospitalized.

During the fiscal year the average general assistance monthly caseload averaged 2,883 families with 7,842 persons. The average monthly grant was approximately $57.82 per family. Increased use was made of surplus commodities particularly in the Aberdeen area.

Emphasis has continued on planning for younger children to remain in their own homes so that they may attend public school, whereever possible, rather than enroll in Federal boarding schools. Social workers reviewed the situation of a number of children already in school and applications for enrollment, based on social rather than educational reasons, to determine whether the children could be assisted to remain with their families or interested relatives. Some children were enabled to remain with their families through provision of aid to dependent children or other assistance, and others to live with relatives. Advice and counsel were given to children in school and their families and school staff in regard to personal problems and summer plans for the childrn.

Contracts were renewed with 4 mission day schools for school lunches and incidental costs, and with 3 mission boarding schools for boarding care. These contracts provided for up to 1,005 Indian children for whom public or Federal school facilities were not available.

The aid to dependent children program became effective in Nevada July 1, 1955. This has made it possible to transfer to this program all eligible Indian families of children who were previously carried under the Bureau's general assistance program or in foster homes. Under the State program, Indian families will receive needed social services and assistance from the same agency and on the same basis as other citizens of the State.

The Senate Subcommittee on Juvenile Delinquency paid special attention to the delinquency situation among Indians. A welfare representative attended hearings of the committee, and a staff member is assigned to the Subcommitee on Juvenile Delinquency of the Interdepartmental Committee on Children and Youth.

In compliance with legislation providing for termination of Federal supervision of trust property belonging to certain tribes and bands of Indians in Oregon, measures have been taken to protect the interests of those members of these tribes who are minors, non compos mentis, or in need of assistance in conducting their affairs. Policies and procedures have also been developed and appropriate activities are in progress for protection of minors and other persons in need of assistance who are members of the Klamath Tribe and the mixed-blood group of Ute Indians in Utah who are also covered by termination legislation.

RELOCATION SERVICES

During fiscal year 1956, of the Indian people who applied for relocation services, 5,316 were assisted to relocate in the four cities where the Bureau had field relocation offices—Chicago, Denver, Los Angeles, and San Francisco. Of this group, 4,211 were included in 1,051 family units, 732 were unattached men, and 373 were unattached women.

A total of 4,402 persons were granted financial assistance to cover all or a portion of the cost of relocation and 914 persons availed themselves of the employment and community adjustment services but were not granted financial assistance.

These services were accomplished by approximately the same numbers of personnel who the previous year gave assistance to 3,461 Indian people. This naturally placed a severe strain on the staff and there was some reduction in quality and quantity of services and assistance provided. However, increased effectiveness of effort, based on previous experiences, offset this to some extent. An increased range of services is planned for fiscal year 1957, with the anticipation that increasing numbers of Indian people will apply for relocation services and plans have been made for a considerable increase in relocation staff.

Continuing efforts were made to acquaint community agencies with the fact that the Bureau is not requesting these agencies to perform special services for Indian people, but only to make their regular services available on the same basis as they do for all other people.

Among Indian people at the reservations interest in relocation opportunities continued to grow. At most agencies there was a constant backlog of applicants awaiting services. Tribal councils, in general, agreed that the relocation services program performs a necessary function and provides a needed kind of assistance for some members of their tribes. The program is being accepted as one of the necessary tools with which each tribal group can work in planning a long-range program to help Indian people to establish themselves as self-sufficient citizens.

At the field relocation office level many new employers hired Indian people, and those with whom the Bureau had previous contact continued to employ workers referred by Relocation Services. Wage rates are increasing gradually, and through experience, field relocation office workers are able to make job placement in more desirable positions year by year. Each year more Indian workers progress to skilled and supervisory positions and their success leads to more and better job openings for newcomers.

More effective job placement and improved counseling in the use of financial assistance funds has resulted in allowing more time for orientation counseling and community adjustment of new arrivals. The average length of time between arrival and the first day on the job during the past year was approximately 7 days. This allows time for more adequate orientation within the limits of time during which financial assistance can be provided. Again, additional staff will add greatly to the effectiveness of this counseling.

LAW AND ORDER

Only one State, Nevada, acted during the last fiscal year to assume jurisdiction in Indian areas under authority of Public Law 280, 83d Congress. The Nevada law became effective 90 days after July 1, 1955, and contained provisions whereby any county which did not wish to assume jurisdiction could be relieved of that responsibility by proclamation of the Governor. About two-thirds of the Indian country in Nevada was, by proclamation of the governor, taken out of State jurisdiction, leaving about one-third of the Indian country in the State subject to State jurisdiction.

All amendments proposed in the Congress to amend Public Law 280 to require either Indian consent or consultation failed of enactment, although the Senate enacted S. 51, after it was amended to delete sections 6 and 7 from Public Law 280.

The Attorney General of Washington rendered an opinion holding that the so-called disclaimer of jurisdiction in the State's constitution was not a bar to assumption of jurisdiction under Public Law 280 or an appropriate act of Congress transferring jurisdiction. At the close of the year, the Portland area office was considering appropriate legislation to recommend to the Washington State Legislature in accordance with the State attorney general's opinion.

During the year two Indian tribes adopted resolutions pursuant to the act of August 15, 1953 (Public Law 277, 83d Cong.), for the purpose of legalizing intoxicants on the reservation. This brings to 30 the number of Indian tribal groups which acted to exercise the local option afforded Indian groups by the provisions of the statute. Although the Indians have generally welcomed the removal of the discriminatory legislation outside of Indian country, they have shown a tendency to act very slowly in the legalization of intoxicants within their reservations.

With the small increase of funds appropriated for law enforcement by the Congress, it was possible to make marked improvement in law enforcement in the Aberdeen area, particularly in North Dakota. The small increase was devoted primarily to operating expenses and care and feeding of prisoners, thus permitting the Indian courts to operate much more efficiently.

REALTY TRANSACTIONS

During the fiscal year 1956 the Bureau carried out a reexamination and reappraisal of realty policies and activities, together with a reorganization and staffing of the realty functions in both the field and Central offices. This was a start toward rebuilding the realty program of the Bureau on a sound and realistic foundation primarily to effectuate an orderly removal of lands from the jurisdiction of the Bureau and to achieve the efficient and economical management of those lands which remain under trusteeship. This has involved the establishment of new policies and legal interpretations, the accomplishment of research work, promulgation of regulations, development of procedural manuals, and the recruitment of a limited number of trained technical personnel and realty specialists. Regulations and manual procedures have been developed to facilitate the expeditious processing of cases to afford better control over individual realty transactions and to insure equities to the landowners.

With an increase in available funds for the fiscal year 1956, the realty staffs in both the field and the central offices have been expanded to an extent that enabled the consummation of a total of 47,128 realty transactions requested by Indian owners as compared with some 26,000 cases reported for the previous year. This is an increase of 81 percent in the number of cases acted upon.

During the year the mechanics were developed and initial steps taken to effectuate the withdrawal of Federal supervision over the lands of those Indians for which Congress passed terminal legislation. In carrying out this terminal legislation, and in response to requests of the Indian owners for sales, patents in fee, certificates of competency and removal of restrictions, 2,526 transactions were closed which resulted in the removal of 265,033 acres of land from the jurisdiction of the Bureau.

On the management side, 14,822 of the 47,128 realty cases acted upon this year were surface leases and permits and 4,615 involved the leasing of oil and gas and other minerals. Also included were some 25,165 transactions which had no material effect on the overall acreage of land under the jurisdiction of the Bureau. These included sales to individual Indians, exchanges between individuals, and individuals and tribes, gifts to members of immediate families and other miscellaneous items.

The nucleus of an appraisal staff was formed during 1956. Professionally accepted appraisal techniques have been adopted with the objective of insuring equity in each transaction involving interests in Indian lands. Guide lines by manual release and other field instructions have been made available to appraisal personnel, and appraisal reports are being prepared in accordance with rules of admissible evidence as set down by the courts. Active recruiting for professionally trained appraisers has been impeded by the urgent national demand, and recruitment is progressing slowly. To relieve this situation, six Bureau employees engaged in this work have been selected to attend appraisal instruction courses sponsored by the American Institute of Real Estate Appraisers. In some instances, where unusual or time-limit valuation problems exist and it is impracticable to perform appraisal work with staff appraisers, contracts have been entered into with qualified appraisal firms and individuals.

The act of August 9, 1955 (Public Law 255, 84th Congress, 69 Stat. 539), referred to as the long-term leasing act, provides a means for better and more profitable utilization of Indian-owned trust and restricted real property. Prior to the enactment of this legislation, most Indian-owned lands, excepting those in the State of Washington and on a few Indian reservations, could be leased for periods not exceeding 5 years. Statutory limitations on the length of tenure prevented the proper development of land of high potential productive value, where the Indian was financially unable to develop such lands and lessees could not afford to make the necessary improvements because the short-term tenure was insufficient to amortize the capital investment required. Many valuable business sites have also remained idle and undeveloped over the years for the same reason.

In addition to the basic work accomplished toward rebuilding and realigning the realty program and organization, many old and difficult land cases that required policy decisions and much research work to resolve have been completed, which has generally resulted in the improvement of the overall status of the realty program.

MINERAL LEASING

Three trends of major importance in the Indian minerals field stood out in fiscal 1956: (1) the phenomenal renewed interest in Osage Reservation oil and gas leasing; (2) the stepped-up search for oil and gas on Navajo lands in the Four Corners area of Arizona, New Mexico, Utah, and Colorado; and (3) the potential expansion of gas development on Indian lands in the San Juan Basin of the Southwest.

The total oil and gas income from all reservations for the year amounted to $41,007,075. Altogether, 3,990 oil and gas leases covering 943,199 acres were approved as compared to 2,931 leases for the prior year covering 716,763 acres. At the end of the 1956 year 17,627 leases were in force covering 5,422,920 acres. A total of 2,115 wells were drilled as compared to 1,193 wells during the prior year.

A total bonus of $9,714,450 was paid for Osage leases compared to a total bonus of $6,604,582 for the prior 5 years combined. A total of 1,422 wells were completed on the Osage Reservation during the past year—almost double the number completed during the prior year. Of these 70.07 percent were commercial oil wells. The primary reasons for the renewed interest in the Osage Reservation may be attributed to the discovery of new pay formations in the old partially developed areas, shallow drilling depth to production and favorable results obtained from water flood projects. In addition, there is available a considerable accumulation of reliable geological data.

On the wildcat lands of the Four Corners area, 6 producing wells were brought in on Navajo tribal land and 2 producing wells were completed on an allotted Navajo tract. The allotted tract brought a bonus of $116,310 to the Indian owner. These strikes are no doubt responsible for an increasing interest in oil and gas development on the Navajo Reservation. The completion of the pipeline from the San Juan Basin to the Pacific Northwest and the construction of additional gas pipelines to California industrial centers offer an opportunity for early gas development and a substantial market for gas production on the Navajo, Jicarilla, Southern Ute, and Ute Mountain Reservations.

The interest in leasing for oil and gas on the Blackfeet and Crow Reservations, Montana, has been steady. In the same State leases were sold this past year for the first time on the Fort Belknap and Northern Cheyenne Reservations. Royalty payments slightly in excess of $1,800,000 were collected from oil and gas leases on the Wind River Reservation, Wyoming.

A total income of $2,881,532 was received for minerals other than oil and gas. Following the general trend, the uranium development has been very active and successful in production and expansion. The "boom" is being replaced with a study of the problems and possibilities of obtaining production profits on the deposits. Both individual operators and corporations are expending large sums in drilling and exploration work. At an advertised sale of Navajo tribal drilling and exploration permits, $253,709 were received for 15,176 acres. It is hoped that this is a foreruner of other sales. As a result of discoveries in the Abrosia Lake area, there is a strong interest in developing Navajo allotments in McKinley County, New Mexico. In addition to the uranium mills being operated at Shiprock and Bluewater, N. Mex., an additional mill is operating at Tuba City, Ariz. A new ore-buying station has been installed at Grants, N. Mex. These will provide an expanded market for ores in the area. As a result of discoveries on the Spokane Reservation, Washington, a bonus of $317,500 was received for uranium mining leases on three allotted tracts comprising 459 acres. There is considerable exploratory work being performed on this reservation. It is expected that a mill will be erected to serve the area. Considerable interest has also developed on the Crow Reservation, Montana.

There is a small but steady production from the lead and zinc mining leases, Quapaw Reservation, Oklahoma, and phosphate from the Fort Hall Reservation, Idaho.

IRRIGATION

Indian irrigation projects vary in size from tracts of a few acres such as subsistence garden tracts to projects of over 100,000 acres and are often the only means of obtaining a livelihood for resident reservation Indian families. Crops produced on these projects during the calendar year 1955 were valued at $47,077,048.

During the fiscal year 1956 a considerable amount of the construction work involved the rehabilitation, repair and betterment of existing facilities. The lands and the landowners of the various projects benefited materially through the improved facilities provided by rehabilitation.

Approximately 7,762 acres of additional lands on the various projects were served during 1956. This involved the extension and rehabilitation of 113 miles of canals and laterals; enlargement of 20 miles of canals; construction, repair and rehabilitation of some 710 various types of water control structures, drilling and rehabilitation of 13 deep wells; and the construction of storage dams to provide additional storage of 18,035 acre-feet.

Power facilities on the Colorado River (Arizona), Flathead (Montana) and San Carlos (Arizona) projects were extended to serve an additional 267 customers. This involved the construction and extension of approximately 16 miles of transmission and distribution lines and the conversion of transmission lines to larger capacities. These power systems provide electrical energy for project use and serve the adjacent surrounding communities, and, in most instances, are the only source of power available to the customer.

During the months of December, January, and February of the fiscal year 1956, severe flood damage occurred to irrigation facilities on the Wapato (Washington), Klamath (Oregon), Warm Springs

(Oregon), San Carlos, Miscellaneous Pueblo (New Mexico), Miscellaneous California, and Nevada Agency projects. As a result of the emergencies caused by these floods a major part of irrigation activities for these projects during the entire fiscal year was concerned with replacement and repair.

The most important Indian irrigation development work other than flood repair work during the year was on the following projects:

Colorado River Project, Arizona

Emphasis was placed on drainage work during the year and intensive studies were conducted in order that final drainage plans will be completely adquate. Other drainage work consisted of the installation of 1,450 piezometers on 40,000 acres of cultivated land; the cleaning and deepening of 26 miles of drains; the excavation of 4.5 miles of new drains; and the rehabilitation of 4 drainage pumps. In addition to the drainage work, 2.5 miles of a large irrigation canal were lined with gunite.

Navajo Hogback Project, New Mexico

The main canal of this project was extended for a distance of 2 miles with necessary structures including installation of a 72-inch steel pipe siphon 1,200 feet in length and the construction of a reinforced concrete check, wasteway, and chute, 355 feet in length.

San Carlos Project, Arizona

The rehabilitation and enlargement of the Picacho Reservoir was completed in May adding 18,000 acre-feet of storage to the project.

Flathead Project, Montana

The construction work on this project consisted of the concrete lining of 6,070 feet of the Dry Creek Canal and 1,975 feet of the Polson pump canal. Power improvements for the year consisted of the modernization of the Roman substation, installation of a new transformer bank at the Ravalli substation and the installation of a 34.5-kilovolt switching structure at Kerr substation.

Engineering Plans and Surveys

Investigations and field studies were carried on in the Kohatk area of the Chui Chui project (Arizona) to determine the availability of groundwater; reconnaissance soil surveys were made on 1,200 acres of land near Towaoc, Colo.; preliminary surveys were conducted on 5,000 acres of Southern Ute (Colorado) lands in connection with the proposed Animas LaPlata project, and detailed soil surveys were completed on 4,500 arcres of land on the proposed Mancos project.

In addition to the usual, regular preliminary and preconstruction surveys, extensive field examinations and studies and the collection, preparation and assembling of data for the protection of Indian water rights were continued during the year for use in connection with the water suits entitled *Arizona* v. *California*, and *Texas* v. *New Mexico.* Indian water rights were also involved in connection with the Columbia River Compact, Klamath River Compact, and the Ahtanum suit on the Yakima Indian Reservation.

FORESTRY

During the calendar year 1955, nearly 662 million board-feet of Indian timber was cut under contract or used by Indian tribal sawmills. In addition to this commercial type of operation, about 116 million board-feet of timber was cut by Indians and non-Indians for local use. Cash receipts from the stumpage cut under contract and used by tribal sawmills exceeded $11,250,000. Cash sales for local use yielded an additional $104,000, and the timber cut by Indians under free use had an estimated stumpage value of $330,000. The total harvest during the year, therefore, amounted to 778 million board-feet, which had a stumpage value approaching $11,750,000.

The combined contract sales and Indian sawmill use in 1955 exceeded corresponding operations in 1954 by 28 percent in volume and 32 percent in value. As in past years, the Pacific Northwest led all other sections of the timber-producing areas, and accounted for 71 percent of the volume of sales and 75 percent of the receipts.

Considerable progress was made during the year in field work to obtain timber inventories for use in revising the estimates of allowable annual cut. The assembling and interpreting of these basic data was in progress or was completed, in 1955, on several Indian reservations, including the Fort Apache and San Carlos Reservations in Arizona, the Hoopa Valley and Tule River Reservations in California, the Southern Ute in Colorado, the Red Lake in Minnesota, the Northern Cheyenne in Montana, and the Jicarilla in New Mexico, the Klamath in Oregon, and the Menominee in Wisconsin.

In most instances, this newly acquired knowledge regarding total volume and allowable cut has revealed that the annual rate of cutting can be safely increased without violating the objective of sustained yield management. This knowledge would have been of little practical value, however, if the appropriations for forest management and timber sale administration had not been substantially increased. The combined effect of improved knowledge and increased appropriations is reflected in the increased volume and value of timber sold during the past year.

Although most tribes prefer to sell their timber to private loggers, an exception to this practice occurs on the Red Lake Reservation in Minnesota, the Menominee Reservation in Wisconsin, and the Navajo Reservation in Arizona. A tribal sawmill operates at each of these reservations. These mills used 45 million feet of the 662 million feet reported above as sold under commercial type of operations; and accounted for $786,000 of the cash income from such sales. In addition to this cash return to the tribes for the value of stumpage used, the mills returned an operating profit of $477,000 during the fiscal year 1955; and paid more than $1,750,000 in wages, a very large portion of which was paid to Indians and those married to Indians.

During the calendar year 1955 the combined Indian Reservations experienced a total of 845 fires, which burned 64,797 acres of land. Only 10.5 percent of this area was forest land, however, the remainder being grass or brushlands. About two-thirds of the burned forest area occurred on two reservations, the Hoopa Valley in California and the Fort Apache in Arizona, when disastrous fires originating in adjacent areas swept over their borders before being brought under control. Lightning was responsible for approximately 50 percent of the fires. Total damage to Indian-owned land and resources was estimated at $314,000. The total suppression cost amounted to $268,000.

Direct insect control work continued during the year on the Cherokee Reservation, to eradicate an attack of the southern pine beetle, which had suddenly become epidemic in that region. Control work was also initiated on the Menominee and Navajo Reservations to combat destructive attacks by the walking-stick insect and the Black Hills beetle, respectively. In addition to these direct attacks, salvage sales of timber were made on the Warm Springs and Yakima Reservations. These sales included timber either killed or exposed to attack by destructive pine-bark beetles.

The only forest disease against which effective action was taken was the white pine blister rust in the Lake States. Some 2,440 acres of control area were worked over, to eradicate ribes, on five reservations. On the 11 Indian reservations in the Lake States, where blister rust control work has been undertaken, 77 percent of the control area is now on a maintenance status, and requires only occasional checks to determine whether the alternate host plants for the disease are becoming reestablished.

RANGE MANAGEMENT

The 44 million acres of Indian rangeland has a rated grazing capacity of approximately 880,000 cow units. More than 33 million acres having a grazing capacity of 550,000 cow units were used by Indians largely for the grazing of family subsistence herds. Cash receipts for the use of the Indian rangelands during the fiscal year were approximately $2,865,000. Free use privileges granted to Indians were valued at $3,500,000.

These lands are divided into range units and permits are granted thereon proscribing maximum stocking, proper season of use and other conservation stipulations to obtain optimum use consistent with sustained forage production. Range not required for Indian use is offered to the public for competitive bidding.

Difficulty is still being experienced in obtaining proper use of large areas of tribally owned range in New Mexico and Arizona. The prolonged drought and the heavy demand by the Indians for forage for their livestock has created an overgrazed condition that will require careful management over a long period of time to correct.

The estimated value of the take of fish and wildlife resources in 1956 was over $2,200,000.

SOIL AND MOISTURE CONSERVATION

Soil and moisture conservation activities and practices applied on Indian lands during fiscal 1956 reached an all-time high. Indian farmers and ranchers joined with other community leaders in actively engaging in conservation planning and development. This is evidenced by the fact that 90 percent of all Indian lands in established soil conservation districts are covered by working agreements with them. Involved in this are 27,663,000 acres of land located in 231 districts. Local conservation associations or enterprises are operating on much of the Indian land not included in such districts.

To serve as a guide in the proper use of this land, 11,069 individual farm and ranch plans were developed with the operators on 3,010,687 acres of Indian land. Basic inventory and utilization surveys were carried out on 17,169,678 acres in the formulation of the plans and the ervicing of plans previously made. As a direct result of cooperation n carrying out farm and ranch plans, approved cropping systems were carried out on 2,082,739 acres of Indian lands. Cultural practices—including cover crops, deep plowing, residue management, rough tillage, strip cropping, and weed control—were initiated on ,028,889 of the some 3,500,000 acres of dry and irrigation Indian farm land. On the basis of recommendations of soil technicians and engineers especially assigned to study problems relating to the improvement of water-logged, alkali, or otherwise unsuitable lands; 6,974 acres were leveled, 7,146 acres were drained, and 9,855 acres treated for alkali or similar conditions. Thus, 23,975 acres of land were brought into a high state of production.

Revegetation of range lands through artificial and natural means has resulted in the reseeding of 95,558 acres of range land, the elimination of undersirable brush and woody plants from 73,134 acres and the construction of 1,348 miles of fence for the protection and management of these related land areas. In addition, 1,173 ponds were constructed for livestock water, 185 minor detention structures for flood and erosion control, and 39,220 acres of water spreading developed primarily for increased forage production. These measures, to which thea Indians have contributed more than the Government, are developing and stabilizing their land base, controlling erosion, reducing flash floods and utilizing floodwaters for the production of forage and water for livestock. Indian farm and range lands as well as management techniques are being improved; human and livestock carrying capacities increased, and the use of the land facilitated by these works.

When affected, Indian lands are participating in the planning and development of the Small Watershed program authorized under Public Law 566. Two such programs are presently underway.

EXTENSION

The Bureau of Indian Affairs has continued the process of turning extension work to the States and the Department of Agriculture. At the close of fiscal 1956, the Bureau had entered into contracts with 16 of the 18 States where extension work with Indians was formerly carried on directly by the Bureau; this includes roughly two thirds of the total extension program with Indians. The States not covered by contract are Arizona, Mississippi, and part of New Mexico. Negotiations with the Department of Agriculture resulted in an agreement, effective July 1, 1956, under which that Department took over most of the supervisory responsibility for Indian extension work formerly exercised by the Bureau.

State extension workers and the remaining Bureau extension workers were able to assist through the various educational extension programs an estimated total of 17,051 Indian families with practices designed to improve farm, home, and community living. The 4–H Club programs among young Indian boys and girls continued to receive emphasis.

ROADS

In 1956, the Indian road program authorized in the Federal-Aid Highway Act of 1954 at the rate of $10 million a year for 1955, 1956, and 1957, got into full swing. The transition of construction operations from a force-account basis to a contract basis was completed. The utilization of private engineering firms and the services of the Bureau of Public Roads enabled the Bureau to complete the increased survey and plan work with no significant increase in engineering personnel.

Severe floods in Arizona, California, and Oregon made it necessary to postpone construction projects totaling $500,000 and to transfer the funds to maintenance so that the damage could be repaired.

A $1 million program for improving Klamath Reservation roads and turning the entire 750-mile reservation road system over to Klamath County, Oreg., on the termination date (August 13, 1958) was in full operation at the close of the fiscal year.

The Bureau road maintenance program, in addition to the $500,000 flood damage repair item, provided $2,270,000 for the routine maintenance of 18,660 miles of roads, including blading, graveling, ditchng, and snow removal.

During the year $9,461,080 was available for the construction of roads. This enabled the Bureau to contract for grading and drainng of 581 miles, for surfacing of 569 miles, and for 1,200 feet of bridges. This work will result in turning over 500 miles of roads o county governments, thus relieving the Federal Government of future maintenance expense.

CREDIT ACTIVITIES

Indians require financing to develop and utilize their resources, both physical and human. More sources of financing are now available to Indians, and their economic activities are probably now more adequately financed than at any time in their history.

The Bureau's credit program consists of two main phases. First, Indians are encouraged and assisted in obtaining financing from the same credit institutions that serve other citizens. Second, Indians who are unable to obtain financing through customary channels are assisted with loans administered through the Bureau.

Financing Through Credit Institutions Serving Other Citizens

The same institutions that finance other citizens now supply the major part of the Indians' credit requirements. The enactment of

Public Law 450 approved March 29, 1956, authorizing the execution of mortgages and deeds of trust on individually owned Indian trust or restricted land, should be of assistance in enabling more Indians to obtain financing through customary sources.

Because many Indians now deal with lenders on the same basis as other citizens, complete information is not available on the amount of financing received by them. The data which are available are not entirely comparable. Incomplete reports, however, show a continual upward trend as follows:

Calendar year:	*Amount*
1952	$22,315, 000
1953	27,665, 000
1954	33, 960, 000
1955	55, 725, 000

Bureau's Credit Operations

Financing through the Bureau involves two main funds; (1) tribal moneys, and (2) a revolving loan fund. Two old programs—"reimbursable" loans which were made many years ago, and loans of livestock repayable "in kind"—are in process of liquidation. The unpaid balance on "reimbursable" loans has been reduced from $1,078,805 at the close of 1952 to $498,299 at the close of 1955. The unpaid balance on loans of livestock repayable "in kind" has been reduced from 37,083 head at the close of 1952 to 26,065 head at the close of 1955. A total of $1,691,166 had been accepted in settlement of "in kind" loans at the close of the fiscal year which was deposited in the revolving loan fund. These moneys are available for cash loans to Indians and Indian organizations.

The following shows the amount involved in the Bureau's credit program at the close of the last 4 years:

	1952	1953	1954	1955
Tribal funds	$8, 537, 445	$9, 704, 611	$9, 669, 468	$17, 300, 578
Revolving loan fund	11, 335, 261	10, 173, 745	9, 505, 193	8, 311, 374
Livestock loans [1]	3, 661, 498	2, 126, 969	1, 655, 160	1, 133, 940
Reimbursable [1]	1, 189, 364	1, 024, 488	841, 568	498, 299
	24, 673, 568	23, 029, 813	21, 671, 389	27, 244, 191

[1] In process of liquidation. Value of livestock estimated.

Use of Funds by Tribal Organizations

Tribal funds and revolving loan funds are used by the Indian organizations for two purposes; (1) to finance enterprises which are operated for the benefit of all members of the particular tribe involved, and (2) for relending to members and associations of members. The following shows the balances outstanding at the close of the last 4 fiscal years:

	1952	1953	1954	1955
Enterprises	$9,327,886	$9,026,322	$8,913,728	$14,232,917
Individuals	8,420,418	8,861,220	8,562,825	7,521,799
Cooperatives	273,767	149,974	136,650	161,177
	18,022,071	18,037,516	17,613,203	21,915,893

Payments totaling $255,760 were delinquent at the close of the fiscal year on the financing of enterprises. The enterprises involve activities of various types. They include 5 salmon canneries and 54 trading posts in Alaska native villages, and livestock, leasing, soil conservation, stores, motels, lodges, oyster farming, and arts and crafts enterprises in various sections of the Indian country. The collectibility of some of the loans to enterprises is questionable. Four villages in southeast Alaska which are indebted to the United States for loans totaling $3,311,943 which were received for the acquisition and operation of salmon canneries, experienced poor fishing seasons the last 3 years. The 1955 operations of the canneries were fairly successful, however, and the loans are now in better condition than they were at the close of 1954.

In addition to cash loans made to individuals as shown above, there was an estimated $2,288,328 outstanding at the close of 1955 in loans made by Indian organizations repayable "in kind."

The decline in the amount loaned to individuals during 1955 was due mainly to the cessation or curtailment of credit operations for three tribes for which terminal legislation was enacted—Klamath, Menominee, and Northern Ute. The repayment record on individual loans at the close of 1955 was not satisfactory. In fact, the rate of delinquency increased from 16.94 percent of the unpaid balance at the end of 1954 to 19.69 percent at the close of 1955.

The repayment record on loans to cooperatives was also unsatisfactory. Considerable loss may be suffered on such loans. A total of $51,033 was either delinquent or owing on loans in process of liquidation. Although corrective measures are being instituted, it should be emphasized that on loans and investments totaling $54,852,096 since the revolving fund was first established, a total of $428,121 or less than 1 percent has been canceled. At the close of 1955 slightly more than 8 percent of all amounts owing by enterprises, individuals and cooperatives was either delinquent or owing on loans in process of liquidation.

Indian organizations and enterprises were carrying $5,962,346 of available cash at the close of the fiscal year.

BUILDING AND UTILITIES

Bureau activities involving buildings and utilities during the 1956 fiscal year were primarily concerned with improving sanitary conditions, providing additional school facilities, and performing work for the Indian Health Division of the U. S. Public Health Service.

An important phase of the work was the improvement of sanitary conditions, expanding water supplies, and water storage facilities, and the abatement of stream pollution. Twelve projects of this type located in seven States were completed at a cost of approximately $556,000.

A second important phase of the work was providing additional school facilities to permit enrollment of children not now in school, and improving substandard school facilities which already existed. Twenty-four projects of this type have either been completed, or are substantially complete. Ten projects reprogramed under the Navajo emergency education program and located at 18 different stations in Arizona and New Mexico were completed at a cost of approximately $780,000. New domitories, costing approximately $500,000 each, which will provide kitchen and dining room facilities and accommodate 304 children each, are scheduled for completion at Winslow and Holbrook, Ariz., in time for the opening of school in September.

A complete new day school costing approximately $323,000, which will provide classroom, kitchen and dining facilities for 180 pupils, is substantially complete at Polacca, Ariz., on the Hopi Reservation. A project at Keams Canyon, Arizona, is nearing completion, which will provide dormitory, kitchen, and dining facilities for 320 pupils, quarters for 20 school employees, and major improvements to the sanitary facilities, at a cost of approximately $1,024,000 for the project.

In accordance with Bureau policy of contracting with private architects and engineers to design and prepare plans and specifications, for all major projects requiring new plans, contracts have been negotiated for and awards made to private architects and engineers for 15 projects at a cost of approximately $177,000 for architectural-engineering services.

ARTS AND CRAFTS

The Indian Arts and Crafts Board continued to promote the economic welfare of Indian artists and craftsmen by supplying technical assistance to individuals and groups in the production and marketing of their work. The basic program of the board is threefold: (1) to foster high quality Indian arts and crafts, (2) to educate the Indian craftsmen in modern commercial methods, and (3) to protect both the consumer and Indian producer from cheaply imitated wares.

In fiscal 1956, major emphasis was placed on assisting previously organized groups. In addition, however, the board responded to requests for assistance in setting up new craft organizations at Tama, Iowa; Pipestone, Minn.; Mescalero, N. Mex.; Fort Hall, Idaho; and on the Standing Rock Reservation in South Dakota. A major development is in the making for the whole Northwest area in cooperation with the Northern Plains Crafts Association.

In Alaska the sales of the Alaska Native Arts and Crafts Association were affected by the influx of pseudo-Indian manufactured merchandise and foreign imports. The association met the challenge by reemphasizing its trademark "Genuine Indian-Eskimo Arts and Crafts." With the cooperation of the Army post exchanges, the sales program has already begun an upward trend.

The jade projects at Shungnak and Norvik, Alaska (both above the Arctic Circle) continued to make progress. New members are constantly being added. Of great interest to the project is the return of Ronald Senungetuk, a young Eskimo craftsman, to work with the Indian Arts and Crafts Board representative in Alaska, as his assistant. Ronald was the recipient of the board's scholarship for study at the American School for Craftsmen in Rochester, N. Y.

In the Seminole program, a new cooperative procedure is being developed. The Florida State Extension Service allows Mrs. Edith Boehmer, formerly with the Indian Service but now employed by the State agency, to continue her work with the Seminole crafts people. The Seminole Guild has employed a young tribesman to work as Mrs. Boehmer's understudy in the management and marketing of their products. The sale of their merchandise maintained its high peak of 1955.

In the spring of 1956 the Qualla Arts and Crafts Mutual, Cherokee, N. C., celebrated its tenth anniversary. The net worth of the organization stands at $34,061.21. Five percent dividends paid semiannually to its membership amount to a total of $5,708.53 being paid to them since its beginning. There are now 176 members and the organization has been debt-free for 3 years. During the 10 years the organization has bought a total of $199,742.29 worth of items from the Cherokee craftsmen. These figures tell only a part of the service this organization has rendered to the people of the Cherokee Reservation. The purpose of this organization is to give the craftsman the highest possible price for his crafts and this policy has caused all other shops to pay the same prices in order to buy the quality crafts these members make. The result of better prices paid to the worker is reflected in the improvement in the standard of living for the Cherokee people.

At Rapid City, S. Dak., the Sioux Indian Exhibit and Craft Center is proving an effective instrument in serving the community and the

Indian citizens of the area. Attendance increased 7,037 over the previous year. The mayor proclaimed a week as "Museum Week." The South Dakota State magazine ran an article on the museum. Many newspapers and other magazine articles were written and several programs were given on radio and television. The director also gave constant assistance to the craft organizations at Rosebud, Tama, Pipestone, Sisseton, and Cheyenne River.

For some time a need has existed for practical business information slanted toward the needs of the Indian artist and craftsman. To fill this need, a publication "Business Booklet for Indian Artists and Craftsmen" has been written and will soon be ready for publication and distribution.

PROPERTY AND SUPPLY

In line with overall Federal policy, business-type activities conducted by the Bureau have been curtailed to eliminate production or service in competition with private enterprise. One example is the dairy farm at the Albuquerque school which was closed in fiscal 1956. In addition, 11 telephone systems (3 in Oregon, 2 in Montana, and the others in Arizona, California, Nebraska, South Dakota, Washington, and Wisconsin) as well as 3 power lines (in Arizona, Oregon, and Washington) were sold to commercial enterprise.

The Bureau also continued to take steps toward the disposal of excess real and personal property. The Pipestone School plant in Minnesota was declared to the General Services Administration for disposal. Surveys and other necessary information have been furnished that agency. Approximately 150 acres of the 740-acre tract has been added to the Pipestone National Monument. The General Services Administration is now in the process of disposing of the remainder of the acreage including the school plant.

Finally the Bureau proposed legislation to convey surplus government-owned buildings and improvements on tribal or reserved lands to the tribes. Such legislation was passed shortly after the close of the fiscal year.

BUDGET AND FINANCE

Continued progress was made during 1956 in revising and improving the accounting system installed in Bureau accounting offices in fiscal 1953, particularly in the revision of certain operating and other accounts to better meet budgetary and program needs.

A periodic inspection program was inaugurated to cover the processing of collections and other accounting matters to be performed by personnel of the Bureau's accounting offices and by other qualified staff. Instructions were issued for the merging of separate area general ledger accounts at the accounting office level in order to facilitate reconciliation of accounts and to reduce nonessential record maintenance and reporting. Studies are continuing to further improve, strengthen, and simplify budgetary and accounting requirements (including studies for further mechanization of the accounting work in the area offices) as well as to simplify the reporting requirements.

INTERNAL AUDIT

During 1956 the Bureau established two audit field offices—1 at Albuquerque, N. Mex., and 1 at Billings, Mont. Auditors using these offices as headquarters will give more effective and economical audit coverage of the Bureau's activities. Neither office has been fully staffed because of difficulty in recruiting traveling auditors. Four of the Bureau's 10 areas were audited during 1956, and at 2 of the remaining 6 areas an audit was underway at the close of the year.

MANAGEMENT COORDINATION

Organizational Changes

As the fiscal year drew to a close, the topside structure of the Bureau was altered in acordance with shifts in program emphasis. A new Division of Tribal Programs and Relocation Services was created under an Assistant Commissioner to provide coordinated executive direction to the rapidly developing relocation and Indian social and economic development programs. Also incorporated in the new division were all responsibilities in regard to tribal government, including advising tribes on their governmental and corporate functions, and correlating tribal activities with related Bureau programs. Another important change was the establishment of the Deputy Commissioner to serve as an overall line assistant for the Commissioner. In the field, the most significant organizational change was the division of the huge Navajo Agency into five subagencies, each having jurisdiction over a specified geographical area. The main objective of this reorganization was to bring the administration of Navajo affairs closer to the Navajo people.

Reports and Forms Management Program

Midway in the fiscal year the Bureau inaugurated a reports and forms management program. Some results have been: (1) design of new and revised operating and report forms, particularly those operating forms providing basic data for reports; (2) outlining and charting new procedures; and (3) rewriting policies, definitions, and procedures for Indian Affairs Manual and other instructions.

A survey of Bureau forms in the Departmental stockroom was practically complete by the end of the year. Each branch was asked to review the forms that it had initiated. Forty-two percent of Bureau forms in stock were declared obsolete and approximately 650 square feet of storage space will be released.

Administrative Issuance Review

In October the Bureau began a long-term review of its administrative issuance including the Code of Federal Regulations, the Indian Affairs Manual, delegations of authority and other instructions. The purpose of this review is to:

> (1) Provide a clear set of coordinated instructions on policies, procedures, and standards for the administration of the Bureau.
>
> (2) Eliminate obsolete material that tends to hinder the effective use of the instructions.

By June 30, substantial progress had been made toward the completion of the review and it was anticipated that it would be completed during fiscal year 1957.

Pilot Census Project

The Bureau completed development of forms and procedures to be used in an experimental census of the Indians in the Aberdeen area. This pilot census will have considerable scope in that it will provide certain information on Indian income, family status, occupations and residences never before made available on an organized basis.

Management Reviews

The technique of management review was inaugurated during the fiscal year, and reviews were made in the Gallup and Aberdeen areas. The reviews consisted of cooperative studies of organization and methods by teams consisting of Central Office, Area Office, and Indian Agency officials. The technique was unique in that it brought together representatives from the three levels of Bureau administration for a concentrated appraisal of management practices and procedures in a specific organizational jurisdiction.

PERSONNEL

A program to evaluate the effectiveness of the personnel functions of the Bureau on a continuing basis was initiated for application at both the Central Office and field office levels. Two additional training programs were approved for the Bureau by the Civil Service Commission. One permits the employment during vacation of students as trainees in soil conservation activities. The second is entitled "The Junior Internship Program" and utilizes the newly established Federal Service entrance examination to bring new employees into the Bureau at the GS–5 and GS–7 level. The junior internship training has been combined with the departmental management and executive development training program to constitute the Bureau's overall career-development program. Two boards of civil-service examiners have been established, one in the Central Office for social workers and one in Denver, Colo. for relocation officers. The Bureau also participates in the joint departmental board that was established in Juneau, Alaska, in conjunction with bringing the positions in Alaska into the competitive service.

BUREAU OF LAND MANAGEMENT

Edward Woozley, *Director*

PUBLIC LANDS

THE Bureau of Land Management was established as the Department's chief custodian of the public domain on July 16, 1946, when the General Land Office (established in 1812) was consolidated with the Grazing Service (created in 1934) in accordance with the provisions of the President's Reorganization Plan 3 of 1946.

The Bureau exclusively administers approximately 468 million acres of public domain lands, about 290 million acres of which are in Alaska. Most of this land is unappropriated and unreserved.

BLM also manages the publicly owned mineral resources in about 58 million acres of privately owned lands.

In addition, the Bureau participates in the disposal of natural resources in another 242 million acres of federally owned lands reserved for national forests, national parks, national monuments, wildlife refuges, historic sites, irrigation projects, military or atomic energy use, power sites, and other public purposes.

Still another responsibility of BLM is what is known as acquired lands, some 58 million acres that came into Federal ownership through purchase, exchange, transfer, condemnation, or donation.

Functionally, the Bureau of Land Management manages, conserves, and, under a policy of development through wise use, disposes of the land and its natural resources, including the range grasses and other forage, the minerals (including oil and gas), and approximately 472 billion board-feet of commercial and woodland timber.

These activities fall principally into six categories—Lands, Minerals, Range, Forestry, Cadastral Engineering, Records.

Principal accomplishments for the fiscal year ending June 30, 1956, in these activities are summarized in the following pages.

LANDS

The Bureau of Land Management conducts studies and classifies public lands for proper use; processes withdrawals of land for use by the public or governmental agencies; restores lands from such withdrawals for use or for disposal under public land laws; acts on applications and claims for the use of or title to public lands; issues leases, licenses, or permits for land use; grants instruments of patent or other title conveyance in fulfillment of the public land laws.

Lands Legislation

Both the Congress and the Department of the Interior during the year gave intensive consideration to legislation needed to perfect and modernize existing land laws, and to make legislative provisions for new and changed conditions. Sparking this effort was the continuing intensification of the demand for lands and their resources, necessitating legislation of two general classes: (1) Laws to meet the needs of specific situations, and (2) General laws to provide the basis for administrative actions to meet recurring problems and needs.

The second session of the 84th Congress and the Department considered many proposals of both classes during the year.

Several laws were enacted to meet specific situations. One of far-reaching effect was Public Law 830, the Alaska Mental Health Act, which among other things, granted the Territory of Alaska the right to select 1 million acres of public lands to aid in the support of the mental health program and other Territorial activities. Public Law 522 authorized the sale of certain public lands to the city of Henderson, Nevada, for its future development. Other measures were: Public Law 525, transferring certain lands in Arizona to the Yavapai Tribe; Public Law 696 transferring a small acreage in Utah to the Kanosh Band of Indians; Public Law 722, restoring to tribal ownership the remaining ceded lands of the Colville Tribe, Washington; and Public Law 926, transferring certain lands in New Mexico to the Pueblos of Zia and Jemez; Public Laws 846 and 891, abolishing two national monuments, Verendrye, N. Dak., and Fossil Cycad, S. Dak. (found not to be of national interest) with special provisions for their future use and disposition; Public Law 456, permitting the sale of certain lands to a Lake County, Oreg., school district; and Public Law 589, authorizing the sale of certain recreational lands in Montana to an American Legion Post.

By Public Law 892, Congress paved the way for the solution of the problems which have prevented the lifting of the highway and other right-of-way withdrawals in Alaska. This law permits the Department to grant preference rights on restored lands to the owners and laimants of lands abutting present withdrawals. Revocation of the vithdrawals without such authority would have done grave injustice o settlers and developers along the highways.

By another act, Public Law 834, the Congress recognized the diffiulties being experienced by many homestead and desert-land entrynen in the States owing to the current farm surplus situation. The aw grants such homesteaders leaves of absence and permission to uspend development operations until March 1, 1959. It contains everal provisions to prevent speculation in such entries and also to ermit use of the lands by Federal permittees, licensees, and lessees uring the period of suspension.

In addition to the above, several public and private laws were passed o quiet title to certain specified tracts of land or to grant equitable elief to individual claimants whose claims could not be recognized nder the public land laws. The records on these laws reflect careful crutiny by the Department and the Congress of the equities involved.

Laws enacted of a more general nature included Public Law 698, liminating the necessity for two final proofs from homesteaders on nsurveyed lands in Alaska; Public Laws 699 and 932, clarifying the ights of the States and Alaska to their school sections in order to liminate inequities in existing law; and Public Law 931, improving he law respecting allotments to Indians, Aleuts, and Eskimos in laska.

Although the Congress did not take final action on the proposals, he Congress and the Department devoted much time and energy uring the year to several significant legislative suggestions. Among hese were the management and disposal of tidelands, submerged ands, and inland navigable waters in the Territory of Alaska. The ideland question is of particular importance because many communiies in Alaska are dependent upon the tidelands for further growth nd expansion.

Other important fields considered but not finally acted upon inluded legislative policy for the disposition of the Bankhead-Jones ands purchased by the Government during the 1930's; congressional ontrol over the reservation of public lands and outer Continental helf waters for military purposes; clarification of the surplus proprty acts as they apply to public domain lands and minerals; conressional policy as to the recreational use of the public domain; land rants to the Territory of Alaska; entries on coal and oil or gas lands n the Territory; amendment of the public sale laws to facilitate disosals of unneeded Federal lands; and allowance of desert-land enries on noncontiguous public lands. Although the bills were not nacted, departmental research and congressional hearings have esablished valuable background material for their further consideraion.

Considerable progress was also made during the year in the program for consolidation and modernization of the public-land laws. Among the more important items in this program were drafts of proposals for authority to dispose of public lands for commercial and industrial purposes, consolidation and revision of the rights-of-way laws, a uniform measure of damages for trespass on the public lands, and consolidation and revision of the townsite laws. Several other items were added to the vast body of public-land laws.

Regulations and Procedures

During the year the Director's staff continued to give high priority to the issuance of policy statements, manual procedures, and regulations, basic guides for the management of the public lands and for informing the public of its opportunities, rights, and privileges under the public-land laws.

A major problem which was attacked vigorously during the year was the administration of the Small Tract Act. Private promoters, recognizing the basic desire of the people for a tract of land of their own, seized upon the provisions of the Small Tract Act and regulations to promote applications for small tracts through widespread advertising in all media. As a result, the Bureau was inundated with thousands of small-tract applications from all over the country from people who did not know the character of the lands selected and the terms and conditions of the small-tract regulations. Many applicants, of course, expressed disappointment when they were informed of the actual requirements.

Besides calling the attention of the Department of Justice, the Federal Trade Commission, Post Office Department, local authorities, chambers of commerce, and the Better Business Bureaus to the problem, the Department approved regulations prepared by the Bureau to meet this unwholesome development. These regulations, together with governing policy and procedure directives under the Small Tract Act, brought a sharp decrease in promotional filings, freeing the Bureau to process applications from people who had bona fide intention of acquiring and developing small tracts. The Bureau directives introduced fundamental policy statements and procedural steps on many aspects of the Small Tract Act, including criteria permitting classification under the act, policies concerning renewals and improvement requirements, and procedures for public sale of small tracts.

Another outstanding field of activity was the whole question of withdrawals and revocations. Directives were issued establishing standard procedures for this subject, including such critical matters as adequate publicity for proposed withdrawals, coordination with State officials and other interested parties in both withdrawals and revocations, and adequate review and negotiation of proposed withdrawals. Intensive demand for lands and resources required a thorough consideration of multiple values involved in wise land management.

Basic land appraisal procedures for Bureau operations were established. This was consistent with the departmental desire to insure satisfactory appraisals of property under its administration and to protect the public interest in securing full value for lease, use, or disposal of lands and resources.

Other administrative clarifications covered homesteads in Alaska, principles for extensions of time to desert land entrymen under permanent legislation, issuance of temporary road rights-of-way, land classification for range rehabilitation projects—all designed to specify procedures and policies in matters which the changing times and economy require for effective and fair administration of the public lands. Emerging problems are thus being met through the Bureau's attention to this important phase of its activities.

Regulations were issued by the Department during the year for small tracts, temporary road rights-of-way, preference rights under he public sale laws, assignment of desert land entries, shore-space estrictions in Alaska, administration of the Choctaw-Chickasaw ands in Oklahoma, and the townsite laws.

Proposals were submitted for departmental review on trustee ownsites in Alaska, fees and charges for services rendered to applicants and claimants, utilization of rights-of-way reserved on mall-tract areas, and exchanges.

This brief recitation of activity in the field of procedures and regulations shows clearly not only the wide variety of lands matters vhich the Bureau must consider but also the close relation of he administration of the public lands with the economy of the country. Use of the public lands, for the most part, is private use and egulations and procedures must keep abreast of the changing onditions of the American economy—a primary objective of the Bureau.

Lands Adjudication

Total applications for the use or acquisition of public lands dropped rom 43,000 cases in the record postwar year 1955 to 23,000 cases in iscal year 1956. Small tract lease applications accounted for nearly ll of this decrease, shared in part with small declines in applications or homesteads, desert-land entries, and State selections. Principal ncreases were noted in applications for public sale, exchanges, and n small tract sales applications by lessees exercising the option to purchase clause of their leases. Concerted effort was pointed toward the reduction of case backlog during the year, with the result that unclosed cases were down nearly 3,000 from 1955.

The large reduction in small tract lease applications during 1956 resulted directly from the tightening of controls over mass filings by promotional land locators, particularly in Nevada and California. In 1955 intensely active land locating promoters, through extensive advertising media, induced thousands of persons from all parts of the country to file, for a fee, small tract applications through their agencies. This surge of filing activity resulted in hundreds of duplicated or "top" filings for the same tracts of land, for which only one person could be a successful lessee.

New regulations which became effective July 5, 1955, required personal inspection of the tract applied for, or lands within one mile of the tract. This new control, together with others, effectively dampened land locator activities, and tended to confine applications to bona fide filings by persons with sincere desire to acquire and develop the lands.

As an outgrowth and extension of Department Opinion M–36263 of February 23, 1955, which held that desert land applications cannot be allowed and that desert land entries cannot be patented where the alleged source of water is percolating ground water in Arizona, some 1,500 desert land applications in California were similarly held for rejection by Bureau of Land Management decision in 1956.

As in Arizona, California State law specifically precludes percolating ground waters from the doctrine of prior appropriation, and therefore cannot be used to qualify for entry or patent under the Desert Land Act. The April 2, 1956, Bureau decision (*Sidney Lee Smith* v. *Mary F. Kershner et al.*), was subsequently appealed to the Department. Final proofs on allowed desert land entries involving the use of percolating ground waters in California were being temporarily suspended as they were received. Approximately 600 allowed desert land entries in California in various stages of development may be potentially involved. Legislation was enacted on August 4, 1955 (69 Stat. 491; 43 U. S. C. 321) so as to provide a waiver in the case of desert land entries theretofore allowed in Arizona of the requirement that the right to use of water for purposes of final proof and patent depends upon prior appropriation.

Withdrawals and Restorations

Withdrawals of public lands in the United States and Alaska during the year aggregated 498,000 acres. In contrast, approximatel 1,203,000 acres were released from withdrawal.

The decrease in public land withdrawals during the past year resulted largely from the suspension after October 27, 1955, at the request of Congress, of all pending withdrawal applications for Defense purposes of the Department of Defense for large areas of public lands. At the close of the year the Department of the Interior had pending before it applications for such withdrawals involving a total of about 9,400,000 acres of public lands in the United States and 100,000 acres in Alaska.

Public concern over the withdrawal and reservation of public lands was aroused particularly in regard to the rapid extension of the land holdings of the various agencies of the Department of Defense which totaled 25.4 million acres on June 30, 1955. Increasing concern, particularly throughout the public lands States, was also evinced over the continued expansion of single purpose reservations of public land areas. Both public and private interests began actively to seek means to obtain fuller utilization and development of all of the resources of the public domain—the soil, mineral, timber, grazing, and other material resources; the fish, wildlife, power, and water resources; the scenic, wilderness, and recreational resources; as well as greater use of various site values of the land itself.

The Bureau of Land Management initiated action to obtain a full review of all present withdrawals or reservations of public domain lands as well as pending or future requests of various governmental agencies for withdrawals and reservations of such lands. The objective of this review is to (1) keep all withdrawals to the minimum required to serve the public interest, (2) maximize the use of withdrawals consistent with their primary purpose, and (3) eliminate all withdrawals that are no longer needed to serve a public purpose.

Classification and Investigations

Land classification is used by the Bureau of Land Management to achieve the most effective use and development of the Nation's public land resources. The Bureau is authorized by law to classify for use and disposal under suitable laws the unreserved public domain lands under its jurisdiction in the United States. In Alaska it is authorized to classify lands only for home, business, recreational, commercial, industrial, and public purposes. Investigations conducted in 1956, however, raise the question whether there is need to broaden this authority in Alaska.

Settlement on the public domain on small tracts for home, business or recreation sites continued to be highly popular in both the United States and Alaska. During the year the Bureau of Land Management leased or sold over 50,000 acres which had been classified and subdivided into 11,469 small tracts in a great many localities in the United

States and Alaska. The most concentrated interest in the acquisition of a small tract is centered in areas adjacent to cities and communities in southern California and Nevada and in Alaska.

In the United States, 97,000 acres were classified for disposition under the Homestead and Desert Land Acts compared to 226,000 acres found suitable the year previous. In recognition of the increasing financial difficulties being experienced by many of the homestead and desert-land entrymen owing to farm surpluses, however, support was given to Public Law 834 which granted 3-year leaves of absence to homesteaders and a 3-year moratorium on cultivation and improvement requirements to both homesteaders and desert-land entrymen.

A major change in land classification for desert-land entry was necessitated by disapproval of percolating ground water as sources of supply for irrigation water in Arizona and California. The Desert Land Act requires an assured water supply based on the doctrine of prior appropriation in order to comply with the requirement of reclamation of all irrigable lands in an entry.

High priority was given to the classification of land for satisfaction of State indemnity selection rights and for consolidation of land holdings through State exchanges. Nearly 500 applications involving 380,000 acres were subjected to examination and classification in order to serve these public interests in 1956.

Most of the land classification work of the Bureau of Land Management is done in response to individual applications for land. The applications are recognized as a public expression both as to land use requirements and land use suitabilities. Insofar as possible, however, land classification was carried forward in advance of demand in order to have lands designated for specific uses and so facilitate the processing of various kinds of applications for land as they are filed. Small area classifications were completed on 24,162 acres in a great many places in the United States and Alaska. But for the high rate of filing of individual applications, 22,372 in 1956, greater emphasis would be placed on this kind of classification work.

Area classifications were completed in various places in the United States where there was particularly intensive interest in the acquisition of lands for various purposes. All lands in these areas were examined and classified whether embraced in pending applications for homestead or desert land entry, small-tract or recreation-area lease or purchase, State selection or State exchange, or for some other form of use or disposal as well as vacant lands potentially suitable for use and disposal under the public-land laws. The following examples indicate the kind of conflicting interests that were involved in typical area classification projects.

Because of fragmentation, isolation, and other problems of administration, small areas of public lands in seven of the Eastern

States were the object of immediate disposal in fiscal year 1956. In these States, 56 separate public sale classifications were made and a total of 54,600 acres were sold under the public-sale law, and the Small Tract Act. Thirty-nine such sales were held in Arkansas, where 47,600 acres of public lands were disposed of. The additional 7,000 acres sold were located in Alabama, Florida, Indiana, Michigan, Minnesota, and Wisconsin.

The classification of lands for irrigated agricultural development under the Desert Land Act received considerable attention in Idaho in 1956. Nearly 9,500 acres of desert lands were examined for suitability for agricultural development under this law, of which 7,300 acres were classified favorably, and 2,200 acres classified unfavorably (until a satisfactory showing of a source of irrigation water is made by the applicants). Idaho also classified 87,000 acres of public domain range land as suitable for reseeding, in effect precluding the operation of the disposal land laws for these lands unless satisfactory showing could be made for land uses higher than for grazing purposes.

In Alaska, where nearly 80 percent of the total land area of the Territory is under the jurisdiction of the Department of the Interior, it is of primary importance that suitable public lands be made available for residential, industrial, commercial, and recreational use. The Bureau in 1956 classified a total of 2,660 acres of public lands for these purposes under the recreation and public purposes law, the Alaska Public Sale Act, and the Small Tract Act. There is no classification law governing agricultural entry on public lands in Alaska

The States of Arizona and New Mexico classified a combined total of 5,800 acres of public lands into 1,300 tracts under the Small Tract Act in 1956. Essentially all of the tracts were filed upon by the public and leases issued.

Nevada initiated investigations of 32,000 acres of public lands for disposal under the Small Tract Act during the year, as well as 103,500 acres of desert lands for possible disposal under the Desert Land Act. The reports of the findings of these investigations will show the suitability for classification and disposal of these lands under the two laws cited.

The Bureau of Land Management continued its cooperation with other Department of Interior agencies in a public land inventory and classification program in the Missouri River Basin. A total of 13 million acres of public domain has been classified through fiscal year 1956 of which 1.6 million acres have been determined to be suitable for disposition to private individuals or to other public agencies. Of this total 104,664 acres were classified during the current fiscal year.

MINERALS

The Bureau of Land Management administers the mining and mineral leasing laws, carrying out a program of development, conservation, and utilization of mineral resources. This is accomplished (1) through the leasing of minerals on public domain lands, privately owned lands in which the mineral rights are reserved to the United States, and certain acquired lands; (2) through the issuance of mineral patents and other instruments relating to mineral resource development; and (3) through studies relative to mineral and other resource development and use.

General

In keeping with the policy of multiple use expressed by Congres and the Department, constant effort was directed toward expeditin development of public domain mineral resources in accordance wit laws which make the Bureau of Land Management responsible fo carrying out a program of development, conservation and utilizatio of mineral resources. Under the Mineral Leasing Act, the Burea administers the leasing of minerals in approximately 700 million acre of federally owned lands, including those withdrawn and reserved fo national forests, national parks and other purposes; about 58 millio acres of privately owned lands in which the United States owns th mineral rights; and another 58 million acres of lands acquired throug purchase or otherwise by other Federal agencies.

The other broad minerals function of BLM is the encouragemen of free enterprise and individual initiative under the United State Mining Act of May 10, 1872, as amended, for the discovery and development of nonleasable or "locatable" minerals.

A third and comparatively new but growing mineral leasing function of BLM is that of administering submerged lands of the oute Continental Shelf for development of oil, gas, and other miner resources.

Accomplishment

The volume of mineral activities on all types of land under BL jurisdiction continued at an even higher level throughout the pa fiscal year than in fiscal year 1955, attaining new record highs wi exception of the outer Continental Shelf.

BLM's total earnings from the management and disposal of miner resources of federally owned or controlled lands totaled $179,831,4 for the past fiscal year—far exceeding revenues collected by the Burea in all its other fields of operation. Due to decreased bonus moni totaling $108,528,724 received from competitive leasing in the outer Continental Shelf, as compared to $139,736,404 in fiscal year 1955, grand total receipts were lower than the record $207,775,033 of 1955. The 1956 total royalities, rentals, and filing fees (including OCS rentals) plus bonuses for competitive oil and gas and other mineral leasing by states other than the OCS, reached an alltime high of $71,302,743 as compared to $68,038,629 in 1955. Most of the $71,302,743 consisted of $69,889,972.81 received from royalities, rentals, and filing fees as compared with $66,790,519.76 in 1955.

These earnings were not achieved to the detriment of good conservation practices. No legal or other safeguards against abuses or misuse of lands under the guise of mineral developments were overlooked.

At the same time, multiple-use policy was carried out to the fullest as one of the Bureau's primary objectives in the fulfillment and performance of the obligations imposed upon the Department by law and delegated to BLM.

Close contacts were maintained with the mining industry and the oil and gas, petroleum industry and their representatives and associations, resulting in greater mutual understanding and contributing to the solving of many complex problems inevitable in this tremendous field of activity.

Legislation

New legislation enacted during the past fiscal year had the effect of encouraging expansion of mineral activities both through anticipation and as result of actual passage, particularly through furtherance of multiple use. The principal new laws affecting minerals activity passed during fiscal year 1956 were Public Law 167, Public Law 357 and Public Law 359. Promulgation of new or amended regulations to implement these laws was commenced and partially accomplished during the year.

In addition to drafting regulations, considerable accomplishment was realized in carrying out the new measures.

Under Public Law 167, which provides for multiple use of surface resources on public land, the Bureau made substantial progress during fiscal year 1956 on the 10-year program envisioned for the initiation and completion of the work required under this most important change in the mining laws since the Mineral Leasing Act of 1920. A considerable number of areas were designated and identified as having serious conflicts between surface management and mining operations. Specifically, 79 areas involving more than 3 million acres were designated for examination during fiscal year 1957. It was estimated that some 54,000 mining claims and 24,000 verified statements would be filed, necessitating between 2,000 and 3,000 hearings. Priority was given to selection of areas on which there existed the greatest interference with good land management. Public Law 167 regulations were prepared during fiscal year 1956 but due to their complexity publication was not expected until the second quarter of fiscal year 1957.

Under Public Law 357, progress consisted principally of setting up organization and procedural requirements for acceptance and recording of mining claims filed under this act which provides for the entry, location and mining of uranium and other valuable source materials in public lands known to be valuable for lignite coal. As of June 30, 1956, more than 2,000 mining claims had been filed and recorded with the Bureau, mainly on uraniferous lignite deposits in Montana, South Dakota, and North Dakota. It was anticipated that regulations for administering Public Law 357 would be published early in fiscal year 1957.

Under Public Law 359, the Bureau's major accomplishments for fiscal year 1956 consisted of setting up organizational and procedural methods for the acceptance, recording, and adjudication of claims filed under this act which opened to the staking of mining claims some 7.2 million acres of public lands set aside as power and water sites in 23 States and Alaska more than 40 years ago. As of June 30, 1956, nearly 3,000 claims were filed under a provision of the law which permits interested parties to protest against placer claims. The Secretary has delegated to the Bureau the responsibility of ordering hearings in such claims to determine the facts presented. Protests on hand warranted the expectation that numerous hearings and subsequent decisions would be forthcoming during fiscal year 1957. Public Law 359 regulations were prepared during fiscal year 1956, with publication expected during the first half of fiscal year 1957.

New regulations and regulation changes were also proposed and finally adopted, following waiting periods to allow public comment, for numerous other phases of mineral operations.

Adjudication of Mineral Cases

On June 30, 1956, there were outstanding approximately 100, 922 oil and gas leases on public domain covering 75,436,767 acres, including the Outer Continental Shelf. There were also 4,166 outstanding oil and gas leases on acquired lands of the United States covering 3,852,672 acres. A total of 1,738 permits, leases and licenses for other minerals covering 2,235,825 acres were likewise issued on public domain and acquired lands.

During fiscal year 1956, new and reactivated noncompetitive oil and gas lease offers and applications for lease totaled 45,514 cases, and a total of 46,012 were closed during that period. Approximately 22,776 oil and gas lease assignments were handled during the period. During that same period the new and reactivated mineral patent applications amounted to 221, of which 273 cases were closed during the year. In addition, there were 255 miscellaneous applications in connection with mineral locations and 263 of such cases were closed. In all, 77,815 cases were closed as against 71,988 received, reducing the backlog of cases pending from 30,214 to 24,387.

Table No. 1 discloses the number of mineral cases adjudicated in the continental United States and Alaska during fiscal year 1956.

TABLE No. 1.—*Mineral adjudication operations in continental United States and Alaska, fiscal year 1956*

Type of case	Unclosed cases, July 1, 1955	New and reactivated cases, during year	Cases closed during year	Unclosed cases, June 30, 1956
Public-domain lands:				
Oil and gas leases (noncompetitive)	9,959	42,582	41,579	10,962
Oil and gas leases (competitive)	72	380	604	[1] 1,133
Mineral leases	205	429	316	318
Mineral permits	1,809	1,165	1,460	1,514
Acquired lands:				
Oil and gas leases (noncompetitive)	4,136	2,932	4,433	2,635
Oil and gas leases (competitive)	108	15	123	----------
Mineral leases	5,643	803	928	[2] 678
Mineral permits	873	551	4,873	[2] 1,391
Mineral locations (patent applications)	706	221	273	654
Mineral locations (miscellaneous)	28	255	263	20
Oil and gas assignments (record title)	6,583	22,495	22,776	[1] 5,017
Resource sales	47	32	53	26
Outer Continental Shelf leases (sec. 6)	45	128	134	39
Total	30,214	71,988	77,815	24,387

[1] Adjusted to reflect 1,285 cases transferred from oil and gas assignments to oil and gas leases (public domain, comp.).

[2] Adjusted to reflect 4,840 cases transferred from mineral leases (acquired) to mineral permits (acquired).

Revenues

The chief source of revenue derived by the United States from the use and disposal of the resources on the public lands is from the lease or sale of mineral resources. The revenues realized in fiscal year 1956 from royalties, rentals and filing fees under the mineral leasing acts was $69,889,972.81, compared with $66,790,519.76 in fiscal year 1955. In addition to the foregoing, a major source of receipts is also derived from bonuses offered for the issuance of oil and gas leases. A summary of the bonuses received from mineral leasing by States, as well as on the outer Continental Shelf, is set forth in the following table No. 2.

TABLE 2.—*Competitive leases—fiscal year 1956*

Mineral and State	Total		Acquired lands		Public-domain lands	
	Acres	Bonus	Acres	Bonus	Acres	Bonus
Oil and gas:						
California	40.00	$12,062.40			40.00	$12,062.40
Colorado	7,542.92	87,946.97			7,542.92	87,946.97
Louisiana	382.25	19,628.14			382.25	19,628.14
Montana	1,915.17	7,934.17			1,915.17	7,934.17
New Mexico	6,840.37	180,035.15			6,840.37	180,035.15
North Dakota	292.03	10,702.98			292.03	10,702.98
Oklahoma	129.90	4,180.71			129.90	4,180.71
Texas	1,603.20	611,749.84	1,603.20	$611,749.84		
Utah	228.46	47,291.22			228.46	47,291.22
Wyoming	2,522.67	259,947.25			2,522.67	259,947.25
Outer Continental Shelf:						
Louisiana	252,806.92	[a] 100,091,262.93				
Taxes	149,760.00	8,437,461.60				
Total oil and gas	424,063.89	109,770,203.36	1,603.20	611,749.84	19,893.77	629,728.99
Other minerals:						
Coal:						
Utah	1,762.39	1,763.00			1,762.39	1,763.00
Wyoming	2,553.41	2,554.00			2,553.41	2,554.00
Phosphate: Idaho	3,292.32	165,975.59			3,292.32	165,975.59
Total, other minerals	7,608.12	170,292.59			7,608.12	170,292.59
Grand total	431,672.01	109,940,495.95	1,603.20	611,749.84	27,501.89	800,021.58

[a] As of August 1956, approximately $57,470,303.00 of this amount was held in escrow pending litigation by the State.

Outer Continental Shelf

The Department of the Interior's third "sale" of oil and gas leases on the outer Continental Shelf off the States of Louisiana and Texas was held on July 12, 1955, in New Orleans, La., with 94 tracts covering 252,807 acres off Louisiana and 27 tracts covering 149,760 acres off Texas being leased at that time. There was realized in bonus bids $108,528,724.53, which, together with the first year's rental of $1,207,722 brought into the Federal Treasury almost $110,000,000. This sale, together with the previous two sales held in 1954, have brought thus far more than $252 million in income to the Federal Government.

RANGE

The Bureau of Land Management administers grazing and range activities on some 170 million acres of the public domain, principally through the granting of grazing permits in grazing districts as established by the Taylor Grazing Act of 1934, and grazing leases outside of grazing districts. These activities are managed by the Bureau for maximum productivity of the lands, the highest use of forage, and minimum erosion of the soil. Programs for the rehabilitation of deteriorated range lands and more effective use through more effective distribution of livestock are corollary activities.

The activities in range management for the past fiscal year were directed primarily toward completing the adjudication of Federal range privileges in grazing districts, stepping up the program of range studies and investigations, striving for improved range use supervision, and carrying out a comprehensive range conservation and improvement program.

Range Administration and Management

Special effort was made bureauwide to arrive at a final adjudication of grazing privileges—meaning legal determination of the extent of authorized use of Federal range lands for the grazing of livestock. This program was emphasized in all States, and a reduction in grazing use in some cases amounted to as much as 60 percent of the total grazing privileges previously allocated to the range users. As a prerequisite to adjudication, efforts were renewed to obtain dependent property surveys. In some States this work is practically 100 percent completed. In others, much is left to be done in local areas. Considerable effort was made in every case to increase the number of operations covered by these reports. Development of range management plans and the programming of activities were initiated in most cases as a necessary part of orderly range administration.

Long-term grazing permits were offered to Federal range users as soon as the requirements could be met. Special rules for administering grazing districts were approved for one district in Montana and one district in New Mexico to provide for a more equitable apportionment of Federal range privileges and better resource management.

Without exception the States have pointed out that a lack of sufficient personnel has seriously handicapped the range trespass aspect of overall administration. Oftentimes suspected trespass or other illegal use cannot be proved with the numbers of range management personnel now authorized for the district offices. An encouraging note was the cooperation received from Federal range users in almost all areas. However, both individuals and livestock associations have been insistent that the Bureau give increased attention to the problem of range use supervision.

Top priority will continue to be given to adjudication of range privileges especially in those areas where past overuse has resulted in a critical condition today. In conjunction with adjudication, range line agreements and allotment divisions are being established to provide for better regulated use of the range and a reduction in trespass.

Wildlife Management, Recreation and Protection

The Federal range plays a very important part in the overall picture of wildlife management. In some States the public-domain lands support up to one-third or more of the total game population at one time or another during the year. Their importance to wildlife is generally well recognized and Bureau employees have been taking an increasing part in wildlife management activities, including census taking, game range studies and other related programs.

It is now the usual thing for district, State, and area personnel to attend annual cooperative meetings on game problems with other Federal and State agencies and individual landowners. From these meetings come recommendations on the seasons and amount of hunting desirable, range rehabilitation work needed, and similar matters.

In some States deer are becoming more and more of a problem since improved range conditions, coupled with more intensive predator control work during the past decade, have increased the deer herds in many areas. This matter is receiving the attention of all interested groups and agencies and in most instances proper remedial measures have been initiated.

It is reported that a range use problem of long standing on the Sheldon Game Range in Nevada has recently been settled by joint action of the Bureau, the Fish and Wildlife Service and the Forest Service, illustrating the manner in which the cooperative approach to game management is being undertaken throughout the Western States. Another example is an agreement between the Arizona Fish and Game Commission and the Arizona State Supervisor which provides a foundation for close cooperation between the two agencies in all matters relating to the field of wildlife and lays the groundwork for joint study of the effects of the Bureau's range rehabilitation programs upon various wildlife species.

The whole field of wildlife management is dependent upon proper public relations. Progress in effective management is retarded by adverse public opinion. California has had such a situation and only through the combined efforts of State officials, Federal agencies, and individuals has the game department finally been able to secure public approval for either-sex deer hunting in that State. The harvesting of does is necessary to maintain control of deer numbers but it has taken a considerable number of years to overcome public opposition to this practice. Overall relations between Bureau personnel and other groups interested in wildlife management are excellent and there is every expectation that cooperative management of wildlife will continue to improve in future years.

Condition of Range and Livestock

The past fiscal year has produced a wide variety of climatic conditions in the western range States. In several States moisture and forage conditions were good to excellent last fall but have since deteriorated considerably, with extreme cases being Montana and Arizona where drought emergency relief programs are now planned or in operation. In contrast, California experienced severe drought conditions during the summer and fall of 1955 which were followed by extremely heavy winter precipitation, and now forage conditions are reported to be the best in years.

Generally the condition of livestock is reported to be good to excellent, excepting the several areas where prolonged drought has led to a reduction in numbers and in some cases complete nonuse of the range.

Range Studies

Since the Bureau implemented a concerted range condition and trend study program several years ago, an increased effort has been made to expand and improve the methods for obtaining and recording basic data.

Training sessions have been held in all States to instruct key district and State personnel in the latest methods of obtaining the required information. Our efforts have been pointed toward a balanced program to include detailed studies of representative areas in support of large-scale and less intensive studies.

As an integral part of this program, an estimate of trend of overall range condition has been made. These estimates will later be supplemented by comparative data as soon as it can be obtained from cumulative records. In spite of the effects of current drought in parts of the West, a good portion of the public range is believed to be stabilized or improved in condition. Those areas which appear to be deteriorating are receiving very careful attention in order that necessary corrective measures may be taken and the downward trend reversed.

In support of the range adjudication program, range surveys are being conducted in most States and some fairly substantial progress has been made in obtaining grazing capacity information during the past year. New Mexico and Arizona have full coverage by range surveys and now require only occasional rechecks of existing range conditions. In Idaho, where range surveys previously covered only a small part of the Federal range area, excellent progress has been made with approximately 1½ million acres completed during the past fiscal year.

The program for obtaining range utilization measurements has suffered somewhat from a lack of personnel available to do the work. However, most States are making as many utilization checks of the range as possible. In some areas special cooperative studies are being carried out as exemplified by Montana, in which hydrological and ecological studies are being made of the Willow Creek waterspreading system by the Geological Survey and Montana State College in cooperation with the Bureau.

Hearings and Appeals

The situation with respect to the conduct of hearings and issuance of decisions on grazing appeal cases remains unfavorable but is somewhat improved since last year. Well over 100 appeal cases were awaiting a hearing at the end of the fiscal year. In some cases the delay in the processing of appeals has seriously handicapped the overall range adjudication program. Idaho and Montana appear to be in the worst shape in this respect, with 17 cases pending in Montana and 74 pending in Idaho at the close of the fiscal year. In the latter instance it is estimated that 59 of the 74 can be disposed of with only two hearings, since they involve similar issues.

Section 15 Lease Administration

Little change has occurred in the overall aspects of administering lands under section 15 of the Taylor Grazing Act (lands leased for grazing outside of Taylor grazing districts). In most States 95 percent or more of the total leasable acreage is now under lease and efforts are being continued to reach 100 percent. While a few States reported that no attention could be paid to section 15 lease areas due to limitations in personnel, most States were able to provide at least some range-use supervision and inspection. Although trespass is recognized to be a serious problem in many lease areas, for the most part the section 15 lands are reported to be in fair to good condition or better. In one State, a small percentage of lease land was rated as to condition and trend, but in other States this type of work has not been possible.

Soil and Moisture Conservation

All States have reported a complete changeover to community watershed programing of project work and this approach to soil and moisture conservation is unquestionably working out very well. Cooperative pilot projects have been approved in many areas in which the Bureau participates with other Government and State agencies and soil conservation district supervisors in providing a comprehensive management and soil and moisture conservation program for the pilot area.

Arizona reports that the magnitude and effectiveness of the Bureau program for reducing the erosion of soil and increasing the production of range forage in that State has attracted much favorable attention. It is believed that this is similarly the case in many other States.

In California one of the important conservation practices is the seeding of wild fire burns immediately after the fire has been extinguished. This has been a very effective measure in restoring vegetative cover in that State.

Utah has made excellent progress in the community watershed program. Fifteen watershed plans have been approved at the State level and several others are in the process of completion. One of the latter covers the Paria River drainage where a joint program is being set up with the Tropic Soil conservation district, the Soil Conservation Service, the Forest Service in the Department of Agriculture and the National Park Service, Bureau of Reclamation and the Bureau of Land Management in the Department of the Interior, all working in close harmony in development of the plan. This drainage is one of the heavy silt contributors to the Colorado River. Since the Glen Canyon and Marble Canyon Dam sites are below the Paria drainage early action on this pilot project was timely.

Emphasis has been placed on range revegetation measures, water development and control structures, land treatment measures which will retain the soil and water in place and provide an increased amount of native or introduced vegetation, and protection fencing to control livestock and preserve treated areas. Cooperation from private landowners and range users is reported to be very good from the standpoint of both monetary contributions and aid in construction and maintenance of projects. In one instance a contribution of $22,000 for these purposes was made by a Utah livestock company, which seems to indicate considerable confidence in the Bureau's overall conservation program.

Halogeton

Significant results were obtained from the Bureau's halogeton work program in controlling the detrimental effects of the plant on the range and in reducing livestock losses. Although the plant continues to spread, its adverse influence has been reduced in areas where control work is complete.

Of an estimated infested area of almost 11¼ million acres, approximately 8¼ million acres is Bureau-administered land. This is nearly 2 million acres more than the infested acreage reported a year ago, due in part to the discovery of new locations and to spreading of the plant within and along the perimeter of general infestations.

During the past year, intensive and extensive surveys were conducted on 11 million acres of rangeland from which halogeton infestation information was acquired. Only a part of this surveyed area is included in the area of infestation, but most of it presents potentialities for such invasion.

Livestock losses from halogeton poisoning still occur quite frequently among sheep herds using the more heavily infested areas, and to a lesser degree in cattle herds grazing such ranges. In Nevada, Utah, and Idaho, numerous cases of poisoning have been well confirmed, while in other States losses due to halogeton lack substantiation and an apathetic attitude toward control measures is prevalent among stockmen.

Halogeton Control

In the past fiscal year, 32,367 acres of Bureau land were reseeded to perennial grasses, mainly crested wheatgrass, for the control of halogeton. These operations included the necessary brush removal and seedbed preparation. Such seedings, when successful, have the effect of suppressing any existing halogeton stand and of providing an additional supply of livestock forage. The added forage makes possible a lighter degree of use on other infested ranges in the vicinity, thereby hastening vegetative recovery to a condition commensurate with effective control of livestock poisoning. Sufficient palatable forage minimizes or eliminates the grazing of halogeton by livestock.

Last year 260 miles of fence were constructed to limit the use of livestock on reseeded and other halogeton infested ranges. These were aimed at the protection of new seedings and seasonal ranges, and the proper distribution of livestock on use areas. Such use control must be correlated with the range management functions of the Bureau such as the perfection of proper stocking of different areas and the apportionment and allotting of the range. Also, another grazing-use distribution device of the range improvement program, water developing, must also be considered and used in any effort to adequately ease excessive grazing burdens on infested areas.

Other means used to increase the palatable forage supply and suppress halogeton on some infested areas include waterspreading systems and contour furrowing. About 900 acres were included in waterspreading projects during the year. Quite often reseeding is done in connection with these projects to hasten desired results.

A great deal of work has been expended in acquainting range users with management requirements to minimize halogeton losses. This public relations effort has likewise been effective in acquiring a considerable contribution from range users in cash, labor, materials, and equipment operation toward the completion of the annual project work program.

Chemical and Mechanical Treatment

Direct eradication of halogeton has been accomplished principally by chemical treatment with spray solutions of low volatile esters of 2,4–D. Only minor acreages have been treated by grubbing or other mechanical removal.

These treatments are directed toward isolated spot infestations, particularly those removed some distance from other populations of the plant. Also, peripheral treatment of general infestations where rapid spread was expected has inhibited the invasion of new areas. In numerous cases, road rights-of-way and gravel pits have been sprayed for removal of seed sources from these rapid-spread areas.

During the past year, 32,731 acres were chemically treated. It is believed that the rate of spread in most areas so treated has been considerably reduced by eliminating seed sources, and a number of small spot infestations have been eradicated. Generally, chemical spraying has resulted in a thinning of halogeton stands, at least during the year immediately succeeding that in which the spraying is accomplished.

Under cooperative agreements, the Bureau has made location surveys on a considerable acreage of reclamation withdrawn land, and applied chemical treatment on infested areas.

Halogeton Research

The Bureau is continuing cooperation in halogeton research directly with the Agricultural Research Service and State agricultural experiment stations. These research agencies are conducting experiments aimed at determining the growth habits and ecological requirements of the plant, and at formulating effective means of controlling it. The studies cover such items as seed-producing characteristics of the plant, soil requirements, plant associations and competition, reseeding evaluation, ground and aerial spraying with 2,4-D, evaluation of various herbicidal compounds including selective herbicides, and grazing intensity trials.

Cooperation of the Bureau in research projects is usually limited to aid in planning, construction of facilities, and application of treatments. Some time is spent in helping to collect data which are ultimately analyzed by the research agncies.

Other Noxious Weeds

Most of the States report that a variety of other noxious and poisonous weeds such as larkspur, death camas, camel thorn, white top, loco, and many others have caused limited livestock losses were a minor threat to maintenance of good range forage conditions. However, in only a few cases has any control activity taken place and this has usually been on a very limited scale in conjunction with local county or State agencies. The need for a stepped-up program of other-than-halogeton weed control is recognized but it will have to await additional funds and personnel before much can be accomplished.

Range Improvements

In keeping with general policy, range improvement funds have been used primarily for maintaining existing projects and range facilities. Considerable maintenance work is also being done by Federal range users under cooperative agreement with the Bureau. In addition, the districts have been able to carry out a limited program of water development, range allotment and drift fencing, and other small-scale range improvement activities. Some reseeding of range lands has also been accomplished although this work has been carried on principally under the halogeton and soil and moisture program.

We are pleased to report that the range improvement program has been materially aided by the fish and game departments in several States. For example, in Colorado substantial contributions have been made to the access road development program and the State has shown a willingness to cooperate in water development projects, range surveys, reseeding, research projects and similar matters.

FORESTRY

All timbered lands under the jurisdiction of BLM—an area approximating 161 million acres in the United States and Alaska—are managed by the Bureau on a sustained yield basis for the purpose of insuring continuous timber production at the highest possible level. This in turn assures economic stability of communities which depend upon the timber resources. The Bureau integrates managemnt of watershed, recreational, and other resources with timber management for the greatest total public benefit. Vital to this end is the Bureau's program for protection from fire, insects, and disease.

Timber Sales

Based on the concept of sound forest management, which prescribes cutting of the mature trees in an amount not to exceed the annual sustained yield growth, the Bureau of Land Management conducts public timber sales that yield substantial monetary return to Federal, State, and county treasuries. The volume and value of timber sold from Bureau forest lands in fiscal year 1956 were the greatest in the history of the Bureau, the volume 834,416,650 board-feet bringing $27,801,486.45, compared to 763,243,000 board-feet of timber valued at $19,903,301.45 sold in fiscal year 1955, the previous high year. These figures include timber involved in trespass settlements.

Timber from the Oregon and California Railroad and Coos Bay Wagon Road grant lands accounted for 664,835,000 board-feet of the total sold and $25,024,063.97 of the total value. Public domain timber sales and other types of disposal accounted for the remainder. It should be noted that during the last 5 years the volume of timber sold on the O. and C. lands has been equal to 95 percent of the allowable annual cut.

During this period, the Bureau was alloted $2,818,455 for the management and protection of these lands. This represents a ratio of income to expenditures of approximately 10 to 1 or $10 earned for every dollar spent. Even after distributing substantial shares to the various public land states and counties, the Federal Treasury realized a net $4,100,000 income for fiscal year 1956.

In addition, the Bureau expended $3,600,000 from receipts payable to the counties on the construction of timber access roads on O. and C. lands in western Oregon. These roads are designed to tap a tremendous volume of salvage timber in inaccessible areas which would be lost entirely if not salvaged soon. This expenditure is in the nature of a capital investment, using funds which normally would have been distributed to the O. and C. counties in Oregon. This investment will be repaid in full with net gains both to the counties and the Federal Treasury through higher sales revenue resulting from wider, more efficient harvesting. From its inception in fiscal year 1951 approximately $10,312,000 has been spent on this program as of May 1, 1956. As a result approximately 146 miles of heavy-duty logging roads have been built or are under construction, representing about one-half of the total program.

Scope of BLM Forestry

The Bureau of Land Management forestry program is one of sustained-yield forest management giving due weight to the relative importance of soil conservation, wildlife, watershed protection, grazing, and recreational values of the forest.

The Bureau manages approximately 161,500,000 acres of forest and woodland—all outside of national forests—in the United States and Alaska. Of this, approximately 36,496,000 acres are in the continental United States, 6,376,000 acres being commercial forest land and

30,120,000 acres, noncommercial or forest woodland. The 125 million acres in Alaska contain 40 million acres of commercial forest land and 85 million acres of woodland.

This tremendous acreage is estimated to embrace almost 260 billion board-feet of timber on the commercial forest lands alone with another 212.5 billion board-feet standing on the less productive woodlands. Although no accurate inventory has been made of a large portion of this area, Bureau foresters estimate that the productive capacity of these forest and woodlands approximates 4 billion board-feet per year, or enough lumber and equivalent wood products to construct more than 350,000 five-room homes each year in perpetuity. The drain of forest products from this great reservoir was 834 million board-feet in fiscal year 1956.

Forest Land Inventory

An elementary component of any land-management program is inventory. Forest-land management is no exception. On the O. and C. and C. B. W. R. grant lands, where forest management has been developed to a high degree, forest inventories likewise have been developed to a high degree, particularly during the past year.

Shortly after the close of World War II, plans for an intensive up-to-date inventory of the grant lands were made. The time-honored method of ground cruising for making the inventory was discarded in favor of the then new method based on the use of aerial photographs.

In the use of photographs for forest inventory purposes, each photograph is studied individually with stereoscopic equipment, and the various forest type classifications are delineated thereon. Any questionable photo interpretation is checked in the field. Upon the completion of the classification of forest types, the volume of the merchantable sawtimber in the stand is determined by random sampling.

The results of the inventory have been noteworthy. The volume of merchantable timber found in the areas where recent inventories have been made has been 20 to 40 percent greater than the estimates provided by the older inventory surveys. The allowable cut, based on the productivity of the forest soils as well as the volume of mature timber and the acreage of immature forest stands, has also been found to be higher than previously computed. This increase averages about 25 percent overall. If the same upward trend of volume and allowable cut holds throughout the entire inventory, the total volume of timber on the O. and C. and C. B. W. R. grant lands may well be found to be upwards of 50 billion board-feet and the allowable cut more than 750 million board-feet per year.

Progress in Forest Management

In June of 1956 an order was signed which provided for an administrative exchange of 241,137 acres of national-forest lands for 242,734 acres of revested Oregon and California Railroad grant lands located in 13 counties of western Oregon. The original land pattern consisted of alternate sections of land administered by the two agencies and the exchange remedies this interlocking jurisdiction by blocking up the lands, making the numerous areas affected either all BLM or all national forest. Administration and management of these lands will be improved by both the consolidated land pattern and a reduction in the public confusion over management rules and practices of the two agencies operating in the same area.

During the past fiscal year an important addition to the mining laws was enacted by Congress which permits multiple-use of surface resources on public lands included within unpatented mining claims. This act, known as Public Law 167, provides for, among other things, government control of surface resources not needed in actual mining operations on public lands covered by unpatented mining claims located after July 23, 1955. The Government retains the right, prior to the issuance of a patent, to manage the surface resources of mining claims, including the cutting and sale of timber, grazing of livestock, and use of the surface of claims for access to adjacent public land and timber. These provisions of the new law will have a marked effect by improving the management and administration of the public lands, and allowing for expanded multiple use.

No sustained yield forest management plan is complete unless provisions are made for the reforestation of cutover and burned lands. While many forest areas naturally regenerate themselves after the removal of the forest cover, other tracts must be planted or seeded to insure a new crop of trees. During the past year over 5,000 such acres were planted bringing the total acreage planted since 1951 to more than 21,500. In addition, some 650 acres were seeded within the past year, bringing the total seeded acreage to slightly in excess of 12,000. Approximately 33,500 acres have been reforested using 13 million seedlings and 3½ tons of seed since the initiation of the reforestation program. Reforestation plays a dual role in the management of forest lands since it both assures future forest resources and also reduces the period required for natural regeneration. Reforestation is an essential of good management.

Protection

Successful management of renewable natural resources requires adequate protection from fire, insects and disease. To this end the

Bureau has been placing increased emphasis on fire protection. In an effort to reduce annual burned area to an acceptable minimum on the 180 million acres of forest, brush, and tundra under BLM jurisdiction in Alaska, cooperation with other agencies has been stressed. Through assistance in organizing and use of fire equipment from our fire-control organization in Alaska, several communities surrounded by public domain lands have assumed full responsibility of their fire control problem. The number and quality of fire training conferences have been increased. This has resulted in the development of better fire plans and has made possible more efficient use of manpower and equipment.

Very high frequency (VHF) radio has been installed in the grazing districts of Idaho and Oregon, and in one or more grazing districts in Montana, Nevada, Colorado, and Arizona. Tests are being conducted in all other districts and plans are being prepared for extension of VHF communications to all grazing districts. Radio telephone has been used successfully in two grazing districts in Nevada and one in Utah. VHF radio and radio telephone permit noise-free reception during periods of high electrical activity common during storms and other periods of high-fire occurrence when good communications are most essential in reducing the elapsed time between detection and initial action on a fire. In Alaska because of the long-haul requirements over numerous mountains medium frequency radio gives acceptable service. All base stations in Alaska have been rebuilt from equipment declared surplus by the military.

Use of three amphibian aircraft transferred from the Navy and three 4-place wheel planes all equipped with radio, have greatly improved the efficiency of the fire organization in Alaska. The amphibian craft has been used very effectively to transport fire fighters and equipment to lakes and airstrips near fires and to airdrop tools, equipment, and food to men on the fire line. The wheel planes here are used for patrol, scouting fires, air-to-ground radio contact with men on the fire line, and for moving fire fighters' equipment and supplies to airstrips as near to fires as possible.

High pressure pumper units mounted on multiple driver trucks are standard equipment on grazing districts for suppressing grass and brush fires. Nearly all districts are equipped with one or more such units. In Alaska the Pacific marine-type pumpers are better suited for fighting timber fires, although in accessible places the high pressure pumpers have proved to be equally effective. Development of a swampbuggy type vehicle for use in Alaska for off-the-road use is underway. If successful this will add to the efficiency of the fire control organization.

Contract protection on nearly 4 million acres of public domain forest and woodlands in the States of California, Idaho, Oregon, Montana, Washington, Arkansas, and Minnesota was continued. An additional 2¼ million acres of BLM administered O. and C. lands in western Oregon bearing high-value Douglas-fir timber are also protected by contract. These lands are scattered and intermingled with ownerships of other agencies having protection organizations. For this Bureau to protect these lands under force account would be a duplication of effort.

While far less spectacular than fire, annual damage by insects often exceeds that of fire and the ravages are much more difficult to control. Insect infestations are difficult to detect and may reach epidemic proportions before adequate control measures can be effected.

A Douglas-fir bark beetle infestation in the Douglas-fir region of western Oregon, California, and Washington which followed heavy windthrow in these areas reached its peak toward the close of 1954. To prevent further outbreaks and the loss of some 13½ billion board-feet of timber, extensive salvage operations got under way. Over half of the estimated 3 billion board-feet on the 1.4 million acres of O. and C. lands have been salvaged to date from existing road systems. At present there is no effective means of control other than removal of infested trees to minimize the spread.

Before salvage could be accomplished on the remainder of the blowdown and beetle-killed timber, a system of access roads requiring several years had to be built.

Seventy-six thousand acres of Bureau of Land Management timber lands adjacent to or intermingled with the national forests and lands of other ownerships in Montana were treated for a spruce budworm infestation during the past year.

As high demands on timber continue, it becomes more important that prevention and control of disease should be given increased protection. The only known epidemic tree disease affecting BLM timber is white pine blister rust, a disease common to the five-needle pines. A blister rust control program was started in 1942 on 150,000 acres of commercial sugar pine near Medford, Oreg. The present project area is approximately 98,000 acres. During the last field season 568 acres were treated with initial eradication and 1,401 acres with reeradication.

CADASTRAL SURVEYS

As the official engineering service for the survey and resurvey necessary to the identification and description of public lands, the Bureau conducts cadastral surveys and prepares plats and field notes which graphically and narratively portray these surveys. The Bureau also prepares maps necessary to administer mineral leasing of the submerged lands of the outer Continental Shelf, and approves and plats mineral surveys executed by United States mineral surveyors.

The 1956 Program

Cadastral surveys are prerequisite to any comprehensive program of land management or development and the conservation of the natural resources. It is fundamental that the boundaries of the lands being administered must be known definitely before funds are expended for their improvement or the development of the resources of such areas. The cadastral surveys create and establish land boundaries, identify the parcels of land and afford descriptions and areas for the various subdivisions for title purposes. The boundaries are actually marked on the ground by permanent monuments. The Bureau of Land Management is not only the official agency for conducting the cadastral survey of the public lands under its own jurisdiction, but also conducts surveys for other Federal agencies on a reimbursable basis.

The cadastral survey program of the Bureau of Land Management for fiscal year 1956 was based primarily upon the needs of management and to aid in the development and conservation of the natural resources vital to the economy of the Western States and Alaska. Surveys were extended over areas valuable for minerals, including oil and gas in the western States and in Alaska. Areas found suitable for homesites were subdivided, thus affording lands to accommodate the demand of the increasing population of continental United States and Alaska. Surveys made in the Pacific Coastal States aided in timber management activities. The location, by cadastral survey, of the boundaries for administration rangelands and the construction of range improvements constituted a necessary part of the program. Of major importance, especially to the States of Arizona, California, and Utah, was the survey of school sections so that those states could obtain title to the lands granted to them at statehood and thus manage and utilize the resources of those lands.

Surveys in the States

In the past fiscal year, 1,361,041 acres of land were surveyed or resurveyed. The accomplished program included the resurvey of forest areas, principally in Oregon and California, to define the boundaries of timber management units, to settle trespass cases, and to provide a basis for timber sales; the survey of small tracts to provide home and business sites; the identification of the sections granted to the States for school purposes; the survey and resurvey of mineral lands for leasing purposes and development; and the survey and resurvey of grazing lands for range management.

Work for other Federal agencies to aid them in the management of the lands under their jurisdiction consisted of the resurvey of 466,200 acres for the Bureau of Reclamation in the Missouri River Basin; the survey and resurvey of 33,280 acres for the National Forest Service in Colorado and New Mexico; the resurvey of 8,080 acres in Idaho at the request of the Geological Survey to determine locations of phosphate deposits; the identification of extant corners of the Rainbow Bridge National Monument in Utah and the subdivision of six sections in the Rocky Mountain National Park, Colo., for the National Park Service; the determination of a portion of the boundary of the Zia Pueblo Indian Reservation in New Maxico for the Bureau of Indian Affairs; the investigation of river bed areas within the Garrison Reservoir, North Dakota, for the Corps of Engineers, War Department; the reestablishment of the boundary of the hospital area at Fort Stanton, N. Mex., for the Department of Health, Education, and Welfare; and the identification of lands reserved for the United States Coast Guard in the vicinity of Port Angeles, Wash.

Also accomplished were miscellaneous surveys and investigations such as the survey of islands and omitted lands in the Eastern States and in Idaho and Montana; a mineral segregation survey for the county of Mohave, Ariz.; the restoration and remonumentation of the Initial Point for the New Mexico Principal Meredian which governs the rectangular system of surveys in New Mexico and the southwestern portion of Colorado.

The survey of school sections made available 103,080 acres of land in Utah, 24,320 acres to Arizona and 28,800 acres to California—a total of 156,200 acres. In general, the program of work was based on the desires of the States to cover the areas of greatest value and interest. In order to make the maximum quantity of school lands available the Bureau adopted the plan of surveying and monumenting only township boundaries and only the boundaries of school sections in each township instead of making a complete subdivisional survey. Since there are 36 sections in each township, not more than 4 of which are designated school sections, this method made it possible to survey nearly 3 times more school sections than could have been surveyed where completely subdivided. By this procedure the Bureau also is able to manage the remaining unsurveyed areas in the townships, as there is sufficient control on the ground to determine the boundaries of any project initiated in the unsurveyed areas.

Alaska Surveys

The program in Alaska was designated primarily to provide for the survey of suitable units of land areas for homesites, settlement, and business sites. In addition to 65,280 acres surveyed under the rectangular system, the accomplishment included the survey of 578 small tracts, 28 homesites, 8 homesteads, 7 headquarter sites, 1 mission site, 7 trade and manufacturing sites, 7 Alaska public-sale sites, 1 Indian allotment, 1 Territorial airport, 1 recreation site, and 23 miles of highway tracts.

RECORDS

Fundamental to the whole real property structure of the public land states and essential to the effective administration of the public domain and its vast resources are the Nation's land records.

These records are the source of such basic information as Federal ownership of public-domain lands; lands which have been conveyed to private ownership; mineral and other rights retained by the Federal Government in patented lands; vacant public lands withdrawn or reserved for special uses; leases, licenses, permits for use of the lands or resources, or both, granted by the United States.

The keeping of the vast official history of such detailed transactions is a responsibility of the Bureau of Land Management that amounts practically to a separate function. The patents alone number more than 6 million and occupy nearly 12,000 volumes.

Until the past 2 years there has not been a major change in the manner of preserving, making entries in, or providing access to these records since 1812. But, with the aid of new techniques, the wornout land records for the Western States, where most of the remaining public lands lie, are being completely modernized. They have been transformed and permanently preserved on microfilm images mounted in key-punched tabulating cards to provide a ready-reference index that will eliminate unwieldiness, slowness, and inaccuracies found in the old system.

Groundwork for the second phase of a two-part program to accomplish the records modernization was laid during the past year. A contract was awarded in October 1955 for the key-punching of nearly 4 million tabulated cards with apertures for mounting 35 mm microfilm images of patents and control documents for completion of wha is known as the control document index.

The control document provides the basis for conversion of the ol records to all-inclusive new master title plats, accompanying use plats and historical indexes for each township in the Western States. Thi work will be accomplished progressively on a State-by-State basis commencing in fiscal year 1957, and the Salt Lake City Land Offic became the site of the first installation for the 2,550 townships i Utah.

Major advantages of the new records system will be the facility wit which the public as well as Federal, State, county, and municipa agencies can get information from or obtain copies of the plats and indexes. Duplicate copies of the 20 x 25½-inch plats can be made in a matter of minutes, simply by running sensitized linen sheets and matte film through a reproduction machine, thus saving hours of copying and handling of tract books.

OUTER CONTINENTAL SHELF

The Eastern States' outer Continental Shelf Office of the Bureau of Land Management was established to take action on mineral leasing under the Continental Shelf Act of August 7, 1953.

Interest in the leasing of submerged lands in the outer Continental Shelf was outstanding during the fiscal year 1956. As of June 30, 1956, an aggregate 230 section 8 leases were outstanding covering 839,437 acres of OCS lands. The United States Treasury has received a total of $252,141,077 in bonus bids and first-year rentals as result of those leases. Approximately 372 section 6 leases (those taken over from the State of Louisiana) covering approximately 1,450,942 acres are also outstanding.

A third sale of mineral leases in the Gulf of Mexico off Louisiana and Texas was held at New Orleans, La., on July 12, 1955, resulting in the issuance of 121 leases covering 402,567 acres of oil and gas lands. Total bonuses and rentals of $109,736,447 were covered into the Treasury. This third sale favorably compares with the two prior lease sales of October 13 and November 9, 1954, when a total of $140,969,005 in bonuses was received and $1,435,625 in first year's rental.

New regulations for right-of-way for pipelines were approved during fiscal year and additional authority to act was delegated to the manager of the New Orleans office in order to expedite the handling of pipeline work.

On June 11, 1956, the United States Supreme Court issued an order prohibiting the drilling of new wells or the issuance of new leases in the Gulf of Mexico off Louisiana except by agreement between the State of Louisiana and the United States to be filed with the Court. The area affected by the order was specified as extending from a line 3 marine miles from shore to a line 3 marine leagues seaward from a line recognized by the Coast Guard as delimiting the navigation rules applicable to inland waters and the open sea. No agreement had been reached between the parties as of June 30, 1956.

EASTERN STATES

The Eastern States office, in carrying out its 1956 program in the Southern States for Florida, Alabama, Louisiana, Mississippi, and

Arkansas, and in the Lake States for Michigan, Minnesota, and Wisconsin, disposed of 61,975.77 acres of land for $620,668.28 through the medium of 151 area and individual public sales and small-tract auctions.

The Russellville, Ark., office completed about 60 percent of its sales program, and it is expected that the total area, originally covering about 112,000 acres, will be disposed of by July 1, 1957. A follow up sales program planning disposal of remaining public domain in the State of Florida, as well as in the State of Minnesota, had now been completed.

FOREIGN ACTIVITIES

The Bureau of Land Management, in cooperation with the International Cooperation Administration and other specialized international agencies continued active cooperation with some 20 countries in all regions of the world on land use and conservation problems.

The Bureau's facilities were utilized by approximately 50 representatives of other countries and experienced BLM officials were made available for technical assistance assignments as requested.

Support on technical problems, international conferences and training centers was continually provided. Activities varied and ranged from forest and grazing land improvement and conservation practices, including small water facilities, in Jordan to collaboration with officials of the Philippine Government on land settlement and mineral leasing.

The homesteading days of the United States are being repeated by the low-cost homestead program of the Philippine Bureau of Lands under which 50,000 individuals annually are obtaining security through land ownership.

Increasing interest is being shown by governments in the management improvements recently adopted by the Bureau of Land Management for more effective handling of land disposal, conservation, land use and resource management activities.

STAFFING

Expanded programs in many Bureau activities necessitated recourse to active recruitment to meet manpower needs. The major colleges in the United States graduating foresters, mining engineers, and other professional categories were apprised of the Bureau's programs and employment opportunities. Recruiters visited some of these colleges. Publicity releases were distributed to technical and professional pub lications. These techniques resulted in an increase in permanent personnel of approximately 20 percent over last year.

Employment in the Bureau on June 30, 1956, totaled 2,267, distributed as follows: Area 1, 580; Area 2, 647; Area 3, 600; Area 4, 163; Eastern States office, 46; and Director's office, 231.

The Bureau launched upon a vigorous and formalized program to obtain more effective results from training. Special emphasis was given to development of technical and professional employees to provide for maximum utilization in these shortage categories. Formal training schedules were developed to improve planning and to insure a comprehensive program.

Four management development conferences were held in October and November 1955, attended by approximately 160 top level supervisory personnel. Appraisal of these conferences by the questionnaire method shows conclusively they were effective in achieving a better understanding of supervisory responsibilities and in pointing up new techniques of management for adoption in the Bureau.

Six management trainees, representing each area and the Washington office, participated in the Department's seventh management training program in Washington.

FINANCE

Revenue from the management of public lands in fiscal year 1956 amounted to $212,216,522. This amount included $111.22 million from the sale of oil and gas leases on the outer Continental Shelf and $100.99 million from public land receipts—a decrease of $27.3 million over the prior fiscal year, due to cancellation of a scheduled May 15, 1955, outer Continental Shelf lease sale as the result of litigation brought by the State of Louisiana in the State courts. The receipts of $100.99 from long-established operations of the Bureau were an all-time high, the previous high being $97 million in fiscal year 1955. Of the total amount, $36.7 million was distributed to States and counties. The receipts were from varied sources, principally from oil and gas leasing, timber and land sales, and grazing permits and licenses.

The Bureau's appropriation for expenditure in fiscal year 1956 amounted to $19,558,245.

FISH AND WILDLIFE SERVICE

John L. Farley, *Director*

EVENTS at the end of the fiscal year 1956 are of particular significance in fish and wildlife conservation. On June 30 the Fish and Wildlife Service completed 16 years of conservation of the birds, fishes, and mammals that are part of the Nation's renewable natural resources. Establishment of the Service on June 30, 1940, was another step in a constant advance of recognition of the importance of these resources. This advance began in 1871 with the appointment of a Commissioner of Fish and Fisheries to investigate the problems of conservation of the country's fishery resources—that appointment led to the Bureau of Fisheries. In 1885 an economic ornithologist was appointed to investigate the economic importance and conservation of birds, and that appointment led to the Bureau of Biological Survey, concerned with problems of wildlife conservation. In 1940 those two bureaus became the Fish and Wildlife Service of the Department of the Interior.

As the fiscal year ended, the Service was preparing for another step in its conservation advance, under proposals in the Congress for greater recognition of the importance of fish and wildlife conservation. These proposals were carried out just after the close of the fiscal year, by the Fish and Wildlife Act of 1956, signed by the President on August 8, providing for an Assistant Secretary for Fish and Wildlife, with the Service becoming the United States Fish and Wildlife Service, under a Commissioner of Fish and Wildlife, and comprising two bureaus, the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife. Under this act, the new Service will be able to improve the conservation of our fish and wildlife resources, through greater efforts to assure wise use, through expanded research necessary for efficient management, and through direct management of certain resources.

During the fiscal year the Service made substantial progress in its promotion of utilization and conservation. Operations were further decentralized to bring them closer to the particular areas they affect, with a strengthening of the five Fish and Wildlife Service regions embracing the northwestern, southwestern, central, southeastern, and northeastern parts of the country. Alaskan operations were under the Administrator, Alaska Commercial Fisheries, and the Administrator, Alaska Wildlife Resources. The Pacific Oceanic Fishery Investigations continued work from Hawaii.

In the brevity of this report, the many accomplishments in the several regions are incorporated in the overall accounts of the various phases of the Service's activities.

ASSISTANCE TO THE COMMERCIAL FISHERIES

The Fish and Wildlife Service's commercial fisheries activities included exploration, technology, market development and education, statistics, market news, and economics. The Saltonstall-Kennedy Act made funds available again to strengthen the nation's commercial-fishing industry, with special emphasis on research and marketing activities by the Service.

The new vessel *George M. Bowers*, completed during the year, is now being used on the fishing gear research program and has aided in the development of midwater trawls and the successful trawl depth electronic telemeter. Explorations of the *Pelican*, one of two recently chartered trawlers, now indicate that a sizable red-shrimp resource exists in the deep waters of the South Atlantic. The trawler *Metacomet* is assisting the Maine sardine program. Explorations by the trawler *Delaware* off New England for deepwater lobster uncovered a much larger resource potential than thought possible. Deepwater trawling by the *Delaware* has uncovered new fishing grounds with commercial concentrations of ocean perch.

The exploratory fishing vessel *Oregon* produced excellent catches of yellowfin tuna in the Campeche area of the Gulf of Mexico during the spring. This development in addition to earlier discoveries of tuna in the Gulf of Mexico indicates that commercial production of tuna may be possible the year around in these waters. Recent explorations by the *John N. Cobb* off the Washington coast added to the knowledge of the extent of the ocean-shrimp resource.

Expectations last year that establishment of the first voluntary U. S. standard of grade and condition for fishery products would soon be a reality have come to pass through joint efforts of the industry and the Government. The first standard has been applied to fish sticks. One major producer of fish sticks has already contracted for continuous inplant inspection based on this voluntary standard. Development of standards for frozen fish blocks and for raw breaded shrimp is well advanced.

The well-balanced research program on the development of new uses for fish oils has made substantial progress. As the elucidation of the complex chemical structure of fish oils, not heretofore accurately known, continues, new chemical derivatives based on these unique fish-oil characteristics are being developed by other workers in this fruitful field of organic chemistry. Fish oils may eventually be valuable in chemical-industry applications just as coal and petroleum now are.

A total of 280 fish-cookery demonstrations, including the distribution of fish-recipe booklets, were conducted by Service home economists for school-lunch and other insitutional food supervisors.

Special market-promotion campaigns were conducted on a national basis to assist the tuna and shrimp industries.

Three fishery educational motion pictures were produced during the year, and two others were in preparation. Of the completed films, one was financed by segments of the outboard motor industry, another by an equipment manufacturer. A third film yet to be completed is being financed by the Maine sardine industry. The Service-sponsored films dealt with the nutritive value of fishery products and fishery-product standards. The outboard and shrimp pictures were chosen for display in international film contests.

Considerable success has been obtained in developing markets for the plentiful and underutilized fish of the Great Lakes.

General statistical surveys for 1954 were completed for all sections of the United States. Similar surveys for 1955 were undertaken.

The Service continued to release monthly bulletins on landings of fishery products in 11 coastal States, and similar bulletins for Ohio and Georgia were begun. Monthly bulletins were released on domestic freezings and holdings of fishery products and on production of fish meal and oil. Quarterly reports on the yield of fish sticks and annual bulletins on the production of canned fishery products, byproducts, and packaged fish also were released.

Completion of a study to improve the collection and publication of statistics on freezings and cold-storage holdings of fishery products materially increased the value of the Service's cold-storage report.

Publication of detailed data on the important Gulf of Mexico shrimp industry was begun, and tabulation of detailed shrimp-catch statistics was undertaken as a basis for biological programs.

To aid in the orderly marketing of fishery products and byproducts, marketing specialists in fishing, distribution, and consumption centers collect daily production and marketing information. This information is disseminated, while it is timely and current, through daily reports by the seven Fishery Market News Service field offices, in Boston, New York City, Hampton (Va.), New Orleans, San Pedro, Seattle, and Chicago. Market News "Fishery Products Reports" provide an 18-year daily record of fishery production, marketing, and price. These reports are used extensively in the fishery industry, in conservation work, in granting loans, in supplying background data for governmental actions, in research, and in determining the economic importance of the fisheries. The field work was completed on the studies of marketing of fishery products in eight key consumption centers other than those now covered.

The monthly periodical Commercial Fisheries Review continued to feature articles and news of trends and developments in the fishery industries of the United States and foreign countries.

Regulatory activities and reports on fishery cooperative-marketing associations were continuel in accordance with the authority vested in the Department by the Fishery Cooperative Marketing Act of 1934. On June 30, 1956, there were 84 active fishery cooperative-marketing associations in the United States and Alaska, the same as in 1955.

Studies were continued on transportation problems, including the effect of higher rates and charges for freight and express service. The problem of imports of groundfish fillets and tuna was kept under constant surveillance. A study of the economics of distribution of Pacific-coast fish was continued to determine marketing processes and the market potential for Pacific-coast fish in the Pacific Coast States. Progress was made on a survey of the fishing industry's hull-insurance and protection and indemnity insurance problems.

A nationwide survey of the shrimp industry aimed at improving production, processing, and distribution of shrimp products was concluded, and the results are being analyzed.

CONSERVATION OF ALASKA COMMERCIAL FISHERIES

The commercial fisheries of Alaska are its most valuable industry Regulation of the fisheries is the responsibility of the Secretary o the Interior and is administered through the Fish and Wildlif Service. While about 25 species of fish and shellfish are taken, by fa the most valuable are the salmon fisheries, which accounted for 8 percent of the total value of products as prepared for market in 1955

Because of the depletion of the pink-salmon runs in southeaster Alaska and Prince William Sound, a vigorous restoration program begun in 1954, was continued in 1955. This consisted of complet closure of the pink-salmon fishery in Prince William Sound, and reduction in trap fishing by 50 percent in southeastern Alaska, couple with large increases in closed areas in various bays to reduce purse seine catches. These restrictions were accompanied by a stepped-u streamguard program to ensure that the increased numbers of spawn ing fish should not be lost to poachers. This program of reserving a larger proportion of the runs for spawning stock resulted again in generally satisfactory escapements of pink salmon from which larger future runs can be expected. Because of this restoration program, and because the record runs of chum salmon of 1954 were not repeated, the pack was but 2,385,163 cases in 1955, the smallest since 1910.

Research on the application of inorganic fertilizers to Bare Lake on Kodiak Island has produced some interesting results. The production of downstream red salmon migrants has been increased with a higher percentage leaving the lake at a larger size and a year younger in age than prior to the start of the experiment. This indicates a possible method of obtaining greater production from Alaska waters.

Continued research on herring showed an increase in catch per unit of effort, spawning area, and the appearance of a young dominant year class. Based on this, an increase in herring population size was predicted and a larger catch quota allowed for 1956. A tremendous increase in herring spawning in the spring of 1956 substantiated the prediction of a larger population.

With a few notable exceptions such as in Bristol Bay, the curtailment of fishing in 1955 resulted in a general improvement in spawning escapement.

From a conservation standpoint it is encouraging to note that the great majority of the operators and fishermen recognized the necessity of the program and supported it. This cooperation will do much to assure successful rehabilitation of the salmon runs.

Pribilof Islands Fur-Seal Industry

Fur-sealing operations on the Pribilof Islands during 1955 produced 65,638 fur-seal skins, 1,756 more than were taken in 1954. Of the production, 20 percent was delivered to the Canadian Government in accordance with the Provisional Fur-Seal Agreement of 1942, between the United States and Canada. Also produced on the islands were 321.4 tons of fur-seal meal and 42,591.4 gallons of oil; these products were sold later in the year by competitive bidding for a gross total of $53,898.

During the fiscal year, two public auctions of United States Government-owned skins were held in St. Louis, Mo. On October 10, 1955, 25,940 skins were sold for $2,354,816. In the second sale, on April 16, 1956, 27,017 skins were sold for $2,494,794.

RESEARCH IN FISHERY BIOLOGY

Coastal Fisheries

During the 1956 fishing season, shad investigations centered on the New Jersey coast, where 2,960 shad were tagged to determine racial composition and fishing mortality by the pound-net fishery. On the basis of previous years' escapements, the Service has predicted for the 1956 season a run of 234,000 shad in the Connecticut River and 5 million pounds of shad in the Hudson River. A 3-year program of research on the striped bass of the Roanoke River was begun in 1955, with particular emphasis on the populations of Albemarle Sound. The Sheepscot River, stocked annually with 20,000 to 30,000 young salmon, has been selected for studies of the Atlantic salmon. The investigational work consists in salmon tagging, ecological studies of the Sheepscot estuary and river, and construction and operation of a salmon-counting weir in the Sheepscot River.

In the Pacific Northwest, laboratory research in electrical fish guiding concentrated on measuring the effectiveness of electrical arrays in flowing water. Field efforts were devoted to studies of the barrierlike fields created by horizontally suspended electrodes. One experiment resulted in diversion of 97 percent of fingerling salmon into the by-pass channel. In the Columbia River, where adult squawfish feed on young salmon released from hatcheries, electrical devices are being used to block the movement of squawfish and to remove squawfish from release areas. Efforts are being made to develop a portable electrical device to trap squawfish in areas of heavy predation. Also studied as a possible method of guiding salmon, different intensities of study and flashing lights successfully diverted over 95 percent of a natural run of blueback salmon.

Two instruments for identifying and counting migrant fish hav been produced and placed in commercial production; the first record the passage of fish in underwater orifices, and the second indicates th direction of passage. Individual fish behavior can now be observed by attaching a sonic tag to the fish. Additional research and development are necessary to increase efficiency of the tag, reduce its size, and increase the range of the receiving equipment. The Fisheries Engineering Research Facility, established in cooperation with th Corps of Engineers at Bonneville Dam, provides for study of migrating fish under controlled conditions.

An investigation is being made on the effects of water use on th physical and chemical qualities of the Columbia River system to correlate changes with migration and survival of fishes. Becaus blueback-salmon spawning is now limited to three major areas, research on fresh-water survival is in progress in Washington an Idaho. Substantial losses in fresh water prior to spawning are attributed mainly to disease aggravated by high water temperatures. A new upstream-downstream weir on Redfish Lake Creek has been installed to collect information on productivity and factors influencing survival and migration.

The most widespread collection of salmon racial data ever attempted in salmon research was completed in 1955, in accordance with a program outlined by the International North Pacific Fisheries Commission. Chartered fishing vessels and shore crews collected specimens and morphological and physiological data from all major red, chum, and pink salmon populations throughout their range in the North Pacific.

Samples of chum, pink, and red salmon from coastal and ocean areas from the Okhotsk Sea to the American coast have shown differences in parasites which appear to be related to differences in oceanographic features. An attempt is being made to discover genetically controlled serological properties characteristic of species and geographic races of salmon.

The stocks of king crab of Bristol Bay and the Aleutians are being investigated as a part of the studies under the International North Pacific Commission. Relative abundance of crabs in the Eastern Bering Sea in 1955 was about 10 percent greater than in 1950 and 1951.

Oyster studies in Long Island Sound have made it possible to issue bulletins which advise oyster growers of the time and area where cultch should be planted. This has resulted in heavy sets. Extensive studies are being undertaken on the control of oyster predators. The joint survey by the Service and the State of Maryland of the Maryland oyster resources included examination of 95 areas. Comparison of this season's figures with those of the 1954 survey indicates fewer marketable oysters and a smaller spatfall. A survey was made of approximately half a million acres of estuarine waters in Mississippi and northwest Florida; of 135,000 acres in northwest Florida, 4,600 acres of nonproducing bottom suitable for oyster culture were located.

Under the direction of the Service, oystermen at West Chatham, Mass., are experimenting with oyster raft culture. By raising the oysters above the bottom and keeping them suspended from rafts, the inroads of drills and whelks, which destroy young oysters, can be materially reduced. Further experiments will begin in July 1956, after spawning. In investigating means of controlling oyster drills, Service biologists discovered that these pests would not cross a barrier of metallic copper. Special fences for oyster beds, utilizing the copper discovery, are being developed.

Studies are being made to determine the causes of the decline in production of soft clams in New England and to find ways of increasing production. Research has shown that increase in green crabs was largely responsible for decrease in soft clams north of Cape Cod The present program is designed to determine why green crabs have increased and to find methods for control. A study to develop management of the hard-clam fishery and to find ways of collecting juveniles for private farming of hard clams is being pursued.

Progress is being made in understanding the role of chemical elements in the metabolism of marine organisms. Fission products, when added to marine environments, are accumulated by marine organisms and eventually may reach man through utilization of marine species of fish and shellfish. These studies attempt to ascertain the mode of entry, the amounts of radioactivity accumulated in different organs and tissues, and the passage of radioactive containments to other species.

Inland Fisheries

The outlook for a more effective and stable program on the Grea Lakes was much improved by the appointment of the International Great Lakes Fishery Commission.

Major effort in lamprey control centered on Lake Superior, the only one of the Great Lakes which still contains sufficient lake trou to support commercial operations. Electromechanical barriers blocked all known spawning streams on the United States shore, and Canadian officials have been extending controls rapidly in the Ontario streams. As a result, lamprey control on Lake Superior is attaining a high level of effectiveness. Control activities on Lake Michigan are still limited to the streams of the northwestern area. Plans cal for blocking all Lake Michigan spawning streams by the start of the 1958 run. Only one barrier has been operated in Lake Huron, and no expansion will be undertaken there until installations have been completed on Lake Michigan.

The search for substances that will destroy larval sea lamprey in streams without injuring fishes has neared the field-testing stage Among the 4,600 compounds in the original screening tests, 8 exhibited strong selective toxicity toward larval lampreys and 2 gave particula promise.

The research vessel *Cisco* completed her second season of work on Lake Michigan, in research on the chub (deep-water cisco). Disappearance of the lake trout resulted in grievous deterioration of chub stocks in Lake Michigan. In the absence of lake trout. sea lamprey turned to chubs as food, and fishermen who formerly took trou changed to chub fishing.

Research in Green Bay centers on yellow perch, the principa commercial species in the southern area and important throughou the bay. Studies of the population since 1952 reveal no significan changes in size, age, or rate of growth but found a more than twofold increase of production.

The *Cisco* is making a limnological-fishery survey of Saginaw Bay and adjacent waters of Lake Huron. Aside from this survey, investigations in Saginaw Bay are limited to studies of fluctuations in growth and abundance of walleyes and yellow perch.

In hatchery production, sporadic disease outbreaks occurred in 1955–56, but no catastrophic losses akin to those of previous years. This season is the second year without an outbreak of sockeye "virus" disease. Experiments at the Leetown, W. Va., laboratory found that products of metabolism excreted by hatching eggs are a factor in the blue-sac disease which sometimes causes loss of more than 50 percent of the affected sac fry. A field method of determination of drug-resistant strains of the furunculosis pathogen has been developed.

There are indications that the management regulations inaugurated for Yellowstone Lake in 1953 are showing desirable results. The numbers of spawners entering the tributaries to the lake are increasing. Fishing success in the 1955 season was the highest since 1949, the catch-per-hour figure amounting to 0.671. Fishing pressure was high, with 520,898 hours of fishing, and the catch of 349,757 fish was the largest yet counted.

Limnological work on Yellowstone Lake in 1955 indicated that the central and northern parts of the lake contain the greatest amounts of fish food. Mapping of the bottom of the lake is being continued as part of the program to relate physical and chemical features to the distribution of fish foods and fish. In the Great Smoky National Park, surveys of 17 streams produced estimates of populations of trout ranging from 5.6 to 83.9 pounds per acre, with most waters showing small gains over 1954 figures. The 1955 year class of rainbow trout was generally small in comparison with that of 1954. Surveys in the fall of 1956 will include other important streams not yet studied. Surveys of 7 streams in the Shenandoah National Park indicated populations of trout ranging from 3.8 to 133.1 pounds per acre.

Marine Fisheries

A new research unit, Ocean Research, located at Stanford University, was begun in September 1955. It will make a broad-scale study of relations between climatic and ocean conditions and the sudden fluctuations of commercial fish stocks—such as the recent failure of the California sardine fishery—with the ultimate purpose of discovering natural laws governing such fluctuations.

In 1955 a coastwide investigation was undertaken to determine the cause and predictability of violent fluctuations in the catch of Atlantic menhaden.

Census estimates of anchovy larvae in the area between Point Conception and Point San Juanico, Baja California, in 1954 and 1955 were twice the estimate for 1951.

The land census of the California gray whale taken from Point Loma, as the whales passed southward to Baja California lagoons to calve and breed, resulted in a count of 903 whales. Air census estimates totaled 826 adults and 138 calves. No explanation can be given for the low count, although fog undoubtedly contributed to a poor land count.

Deep-swimming and surface yellowfin tuna were generally scarce during the year in the Line Islands area. Unfished albacore resources 200–500 miles off the coast of Oregon were discovered. Evidence was found that suggests that the albacore, unlike the yellowfin, may be of one large population with its primary source in the western central Pacific.

As in past years, much of the research in the North Atlantic was in collaboration with the International Commission for the Northwest Atlantic Fisheries. Some results of the 4½-inch mesh regulation for haddock are appearing. The 1952 year class, an unusually large one, was the first year class to come fully under the regulation. Landings of the 1952 year class show an average increase in weight per fish of 16 percent, owing to the selective effect of the large mesh.

An outbreak of "red tide" occurred this year in south Texas and Mexican waters. Research has shown the red-tide organism to be most sensitive to certain metals, of which copper is the most promising as a control.

MAINTAINING THE INLAND FISHERIES

Fishing pressure greatly increased during the year on recreational areas throughout the country and on waters near areas of heavy population. More legal-sized trout were required for restocking waters in these areas, the demand for warm-water species was heavy, and the problem of maintaining the salmon runs continued to be of major importance. To meet these requirements, the Fish and Wildlife Service operated 91 hatcheries and propagated 22 species of fish for distribution to inland waters.

Expanded fish-rearing facilities at a number of hatcheries and improvement in fish-cultural techniques were largely responsible for a 31-percent increase in total weight of fish produced for stocking purposes. A large percentage of the production was distributed to waters on Federal land, near military installations and veterans' hospitals, and on State-Federal management areas.

Congress provided funds for improvement programs at the Springville (Utah), Welaka (Florida), and Pittsford (Vermont) stations. Funds were provided for construction of a new trout hatchery below the Norfork Dam (Arkansas) and for continuing construction of new hatcheries at Millen (Georgia) and North Attleboro (Massachusetts).

The eighth year of work under the lower Columbia River fisheries development program, designed to mitigate damage to the salmon fisheries caused by Federal and other dams, has provided increasing evidence of the soundness of the program. Construction has been nearly completed at the Service's Carson (Washington) and Eagle Creek (Oregon) hatcheries and at the Skamania hatchery of the Washington Department of Game. Eleven hatcheries have been completed under the program since its inception. Major fishway construction has been confined largely to the falls on the Kalama River and Salmon Falls on the Washougal River in Washington. Approximately three-fourths of the diversions in the John Day Basin (Oregon) have been screened. Service biologists, in cooperation with personnel of the Bureau of Reclamation, have developed a new louver-type fish deflector at the Tracy (California) pumping plant.

Studies on trout nutrition and the training program for trout-culturists were continued at the Cortland (New York) fish-cultural station, in cooperation with the State of New York and Cornell University. These activities, and the expansion of rearing facilities at a number of hatcheries, were important factors in the increased production of trout. Production of trout in ponds at several of the warm-water fish-cultural stations during the off-season in winter has been inaugurated. Trout stocked in the fall as fingerlings and removed in the spring as legal-size fish makes efficient use of facilities otherwise idle at that time of year.

Under the Columbia River Fishery Development Program, construction of the Service's Carson and Eagle Creek hatcheries has been nearly completed.

Drought in several parts of the country drew more attention to the need for water conservation, with the result that construction of farm ponds and reservoirs continued to increase. These new waters, new techniques in removing undesirable fish from large bodies of water, and a severe winterkill of fish in the Northern Plains States, all combined to increase the requirements for fish for stocking. Production of walleye and northern pike is receiving more attention as the importance of these predators in the management of large bodies of water is recognized. The training of warm-water fish culturists continued at the Marion (Alabama) station; use of improved techniques in control of Pondweeds, fertilization, and management of rearing ponds formed part of the training program.

The Branch of Game-Fish and Hatcheries employs a small number of fishery-management biologists, primarily to conduct studies of fish-management areas on lands under Federal control, to improve hatchery operations and fish-distribution programs, and to assist other Federal agencies and the States in fishery management. Assistance in the management of fishing waters on or near Defense installations, Veterans' Administration hospitals, national forests, Indian reservations, and wildlife refuges has been especially well received. Although more fish are being produced, as rearing facilities at hatcheries in certain areas are expanded, and improvement programs are being conducted at other hatcheries, these increases in fish production are not keeping pace with the demand for fish for restocking heavily fished waters. In part, this growing need must be, and is being, met by more efficient use of hatchery-produced fish and by better management of fish populations.

The accompanying table summarizes production and distribution from Federal hatcheries in the calendar year 1955.

Fishes and fish eggs distributed—calendar year 1955

Species	Eggs (number)	Fry (number)	Fingerlings		Fish 6 inches or larger		Total weight fingerlings and larger	Total number fish and fish eggs
			Number	Weight	Number	Weight		
				Pounds		*Pounds*	*Pounds*	
Largemouth bass		407, 300	12, 292, 590	27, 738	10, 380	767	28, 505	12, 710, 270
Smallmouth bass		315, 000	89, 480	388	80	114	502	404, 560
Bluegill			51, 328, 070	72, 176	4, 490	1, 150	73, 326	51, 332, 560
Redear sunfish			1, 281, 120	4, 135	560	72	4, 207	1, 281, 680
Channel catfish			770, 100	9, 101	20, 480	2, 946	12, 047	790, 580
Bullhead			13, 790	152			152	13, 790
Walleye		1, 936, 000	553, 810	384	100	5	389	2, 489, 910
Northern pike	1, 300, 000	12, 147, 000	1, 370, 570	1, 506	520	34	1, 540	14, 818, 090
Cutthroat trout	1, 403, 090	150, 000	592, 790	7, 009	41, 880	7, 320	14, 329	2, 187, 760
Rainbow trout	4, 835, 090		9, 431, 640	93, 194	3, 035, 450	728, 616	821, 810	17, 302, 180
Kamloops trout			43, 150	173			173	43, 150
Steelhead trout			19, 560	660	270, 380	27, 498	28, 158	289, 940
Lake trout			626, 090	6, 205	3, 530	733	6, 938	629, 620
Brook trout	6, 424, 840	890, 000	2, 028, 900	31, 732	805, 610	191, 256	222, 988	10, 149, 350
Brown trout	647, 990	76, 680	585, 250	9, 996	426, 640	99, 063	109, 059	1, 736, 560
Grayling	500, 840	370, 000	73, 000	192			192	943, 840
Chum salmon		8, 491, 310	302, 190	2, 194			2, 194	8, 793, 500
Coho salmon	447, 890		622, 150	10, 515			10, 515	1, 070, 040
Sockeye salmon	364, 000		3, 958, 420	50, 117			50, 117	4, 322, 420
Kokanee		6, 012, 580	404, 950	228			228	6, 417, 530
Chinook salmon	5, 093, 070	22, 740	51, 768, 390	415, 642			415, 642	56, 884, 200
Atlantic salmon	200, 080	62, 620	239, 000	2, 248	3, 460	452	2, 700	505, 160
Total	21, 216, 890	30, 881, 230	138, 395, 010	745, 685	4, 623, 560	1, 060, 026	1, 805, 711	195, 116, 690

Acreage acquired or in process of acquisition for fish-cultural stations

State and station	Acquired in fiscal year 1956			Pending title conveyance
	By other than purchase	By purchase	Total	
New York: Cortland FCS		8	8	0
Washington:				
Bonneville (FBS)	3		3	0
Spring Creek (FCS)		6	6	0
Total	3	14	17	0

MANAGEMENT OF NATIONAL WILDLIFE REFUGES

Throughout the history of the refuge program, there has been a constant battle between the conservationists who would perpetuate our wildlife resource through the management of existing wetland areas and a persistent commercial group who would drain and bring into agricultural production such waterfowl habitat. This contest has been made the more difficult for conservationists by the expansion of our population and a general desire for additional agricultural acreage in a period of rapidly increasing land values. As wetlands continued to be lost through drainage, some of it ill-advised, the responsibility of our national wildlife refuges in providing for the needs of waterfowl and other wildlife increased proportionately. The loss of lakes and marshes has been unfortunate, not only in removing available habitat for nesting, feeding, and resting waterfowl, but indirectly in increasing the dependence of waterfowl on agricultural crops with resulting depredations of considrable economic importance.

While the primary emphasis in refuge managment is the production of aquatic and marsh foods, since these frequently have high yields and require no cultivation, it is necessary to supplement such food supplies with field crops. Where unusually heavy concentrations of ducks and geese occur, refuge personnel must farm the land in order that the entire production shall be available for wildlife use. In 1955, this type of cropping was done on 66 refuges, utilizing nearly 25,000 acres. Over 500,000 bushels of grain were produced. Almost three-fourths of this total was on refuges in Oregon and California, where Malheur, Lower Klamath, Tule Lake, Sacramento, Colusa, Sutter, Merced, and Salton Sea refuges each grew at least 15,000 bushels of grain.

On refuges in the Mississippi, Central, and Atlantic flyways, crop production was principally by local cooperators or permittees. In 1955, over 600 cooperators on 86 refuges farmed more than 75,000 acres. Most of the Government's share, amounting to 622,000 bushels, remained in the fields for the birds to harvest, while some was used to prevent crop depredations.

Grazing, haying, timber cutting, and fur trapping are encouraged as management tools to improve habitat for wildlife. These operations are conducted annually by several thousand permittees. Grazing was allowed on 79 refuges, where more than 925 permittees used over 2½ million acres. Over 15,000 tons of hay were cut from 48,350 acres by 326 farmers on 40 refuges. Timber cutting, while not an extensive operation, was engaged in by 300 permittees on 22 refuges. About 14 million board-feet of lumber, ties, posts, poles, Christmas trees, and pulpwood were harvested. Muskrats represent 90 percent of the fur taken; populations of these animals, when kept in proper balance, maintain open areas in the marsh attractive to waterfowl.

In addition to the waterfowl that use refuges, many other species of wildlife are found there. Songbirds, upland game, big game, fish, alligators—all find a place. On most areas, more than 200 kinds of birds have been recorded over a period of several years. Some kinds of quail, pheasant, or grouse are found on practically all refuges. White-tailed and mule deer are widespread. Four fenced preservation areas have herds of American bison. The rare Florida key deer, bighorn sheep, antelope, elk, and moose are among the other big game protected.

National wildlife refuges have a great recreational value in allowing visitors to see undisturbed wildlife in its natural surroundings. Public visitation is encouraged where it will not conflict seriously with the general objectives of refuge management. Roads and trails are charted through many refuges for the convenience of visitors. Various bird lists, pamphlets, and bulletins are provided for those interested in observing or studying natural history on these managed areas.

Public use of the national wildlife refuges has greatly increased in recent years. There were nearly 7 million visitors in 1955 as compared with slightly over 4½ million only 2 years ago. More than a third, or 2,677,452, used the refuges for fishing. Public hunting accounted for 406,219 visitor-days, primarily through the Mississippi River Valley. Opportunities were afforded for picnicking, swimming, and wildlife observation, and these, together with business and official use, amounted to 3,890,776 visitor-days.

Public demands on Congress and on the Fish and Wildlife Service to purchase more land for national wildlife refuges have increased sharply during the past year. Funds for the acquisition of new refuges have been inadequate. No special appropriations for this purpose have been made recently by the Congress. As drainage and other competition for marshes has increased, land prices for refuges have climbed steadily. It is now possible to purchase and develop the equivalent of but one new Federal refuge a year.

Two new refuge areas were placed under administration by this Service the past year. This was made possible by the secondary use of two flood-control reservoirs, secured by agreements from the Corps of Engineers, Department of the Army. The McNary Wildlife Management Area is on the Columbia River in Washington; the Snake Creek National Wildlife Refuge is on the Garrison Reservoir in North Dakota. Nearly 1,500 acres were purchased this year for the Quivira National Wildlife Refuge in Kansas. The refuge, the second in Kansas, was established last year because of the need for a waterfowl wintering area in that part of the Great Plains.

A total of 12½ million acres of land managed primarily for waterfowl is considered the minimum acreage that will carry the present waterfowl population and permit its reasonable increase to a point where the waterfowl hunters of the future can be accommodated on a practical basis. The Federal Government has already acquired about 200 waterfowl refuges containing over 3,370,000 acres. It is estimated that an additional 4 million acres, the Federal Government's share, will cost an average of $40 an acre, or a total of $160 million for the entire Federal program. This includes averaging in the use of Federal reservoir lands where they are suitable and available, as well as future gifts and State lands at a nominal lease or on a cooperative basis. In view of past experience, the future development will cost $20 an acre, or a total of $80 million.

Acreage acquired or in process of acquisition by Fish and Wildlife Service for wildlife-conservation purposes

State and refuge	Acquired in fiscal year 1956			Pending title conveyance
	By other than purchase	By purchase	Total	
California:				
Salton Sea				3
Sutter		118	118	
Colorado: Monte Vista		954	954	440
Florida:				
National Key Deer Refuge	71		71	
St. Marks				5
Idaho: Deer Flat		80	80	
Kansas: Quivira		1, 200	1, 200	2, 339
Kentucky: Reelfoot		261	261	
Louisiana: Catahoula				5, 199
Maine: Moosehorn				1
Michigan: Shiawassee		93	93	125
Minnesota:				
Rice Lake		210	210	
Upper Mississippi River Wild Life and Fish Refuge		11	11	393
Mississippi: Noxubee		601	601	563
New Jersey: Brigantine				48
New Mexico: Bitter Lake				322
New York: Wertheim				8
North Dakota:				
Long Lake				160
Lower Souris	3		3	
Snake Creek	24, 430		24, 430	
Tewaukon		1, 336	1, 336	
Oregon: Malheur		1, 990	1, 990	3, 164
South Carolina:				
Carolina Sandhills		51	51	
Santee		72	72	202
Savannah		5	5	
Texas: Laguna Atascosa				970
Vermont: Missisquoi		834	834	311
Virginia: Chincoteague		25	25	
Washington:				
Columbia		5, 942	5, 942	757
Marrowstone Wildlife Management Area	16		16	
McNary	2, 849		2, 849	
Willapa				410
Total	27, 369	13, 783	41, 152	15, 420

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[1] Name includes "National Wildlife Refuge" except as indicated.

Acres of public domain reserved for wildlife conservation purposes and administered by the States

State and unit	Acres
Arkansas: St. Francis Sunken Land and Marked Tree Floodway	3,990
California: Topaz Lake Public Fishing Area	200
Montana:	
Fox Lake Waterfowl Project	160
Bull Mountain Game Range	1,599
Nebraska: Statewide No. 1 Game Management Area	743
Oregon: Ochoco Reservoir	40
Washington:	
Sherman Creek Game Range	560
Sunnyside Waterfowl Management Area	320
Total	7,612

WILDLIFE RESEARCH

If any one activity in the United States can be said to characterize the times, it is research. Billions of dollars are being poured from both public and private sources into the search for new materials, devices, and compounds to improve and protect the American standard of living. New uses for old materials, and new materials and methods for solving old problems are appearing with startling frequency. Industrial research facilitating an expanded economy has had great impact on wildlife and its habitat, and has thus created need for increased wildlife research. A case in point concerns the widespread use of chemicals.

Chemical treatments hold promise for the farmer, forester, and rancher, of providing the cheapest and most effective methods of crop protection. An outstanding example is chemical protection of tree seeds for direct seeding of forest areas. Experimental plots planted with chemically treated seeds have succeeded better than plots planted with untreated seeds; one chemical in particular shows promise of being effective against birds, forest rodents, and rabbits. Success of this program is attested by the planting in Louisiana in 1955 of more than 10,000 acres with repellent-treated longleaf, loblolly, and shortleaf pine seeds. Chemicals are used to protect both seeds and seedlings. In field studies in Washington, the first-year damage by rabbits to Douglas-fir seedlings was reduced by more than 75 per cent, at a cost for the repellent of less than 50 cents a thousand. Repellent treatments of young hardwoods and conifers in other regions have been similarly effective.

Chemicals are also important in control of rodents, especially house mice and rats, which cause annual losses of millions of dollars to food supplies, packaged materials, and electrical installations, and constitute an ever-present health hazard. Thousands of chemicals have been tested at the Service's Patuxent and Denver laboratories, and several promising materials have been isolated for use as rodenticides or repellents that should contribute significantly to better use of natural resources.

Insecticides have experienced outstanding development within the past few years. DDT, which was viewed with alarm by wildlife biologists a decade ago, has now been largely replaced by more effective insecticides, much more toxic to warm-blooded animals. Use of these materials must be evaluated and field-tested to enable recommendation of applications safe for wildlife. Studies are made on penned game birds to determine lethal doses. It has been found, also, that sublethal amounts affect reproduction of game birds and survival of their young.

Research on pelagic fur seals during the year indicated that the seal is not a significant salmon predator. There was only one occurrence of salmon in 205 seal stomachs collected between the Unimak Pass area and the Pribilof Islands. The problem of hookworm infection on fur-seal pups was studied also. Control of the infection by treatment of the soil has been generally unsuccessful. However, it has been demonstrated that the hookworm is only one of a number of mortality factors on seal pups. Fur studies in Louisiana have concentrated on the nutria, introduced into Louisiana in 1937. This animal has extended its range all along the Gulf Coast and is competing with the native muskrat. It causes some damage to farm crops and to aquatic vegetation in reservoirs. Its value for fur is not sufficient to encourage control by trappers. The Fish and Wildlife Service is cooperating with the Louisiana Wild Life and Fisheries Commission and the Southwestern Louisiana Institute to learn more of the ecological relations of fur animals living in the tidal marshes.

Waterfowl-habitat research follows four general lines. One is the inventory of marsh resources of the United States and evaluation of the rate at which they are being lost. The second involves improvement of existing waterfowl marshes by weed control and manipulation of water levels. Cooperative studies with States along the Atlantic seaboard have resulted in outstanding improvement of several important waterfowl areas. A third approach involves creating new marshes in areas of low economic value, such as abandoned quarries, gravel pits, swampy areas, and sewage-disposal lagoons. The fourth is the development of mosquito-control methods consistent with preserving waterfowl habitat. Concentrated effort along these lines may make it possible to compensate for the ever-increasing loss of waterfowl areas by agricultural drainage and other advances of civilization.

The year 1955 marked the 20th anniversary of the Cooperative Wildlife Research Unit program. During this period 2,373 fish and wildlife students were graduated from the Unit schools, including 377 with advanced degrees. Included in this total are 186 students who were graduated during the 1954–55 year. More than three-fourths of those graduates who did not go into military service or go ahead for further training obtained jobs with State, Federal, or private conservation agencies, or as college instructors. Research was done on 275 projects by the Cooperative Wildlife Research Units during the past year.

Investigations by the section of distribution of birds and mammals are essential to provide basic data for the management of migratory species. Approximately 520,000 birds were banded during the past year, and 35,679 banded birds were reported as recovered. An analysis of banding and recovery methods is being made to improve techniques and to make banding data more useful for management.

A major function of the Fish and Wildlife Service is that of wildlife research for other Federal agencies, chief among which are the Forest Service, the National Park Service, and the Soil Conservation Service. During the fiscal year, public-lands biologists of the Service, cooperating with public land management agencies and private industry, devoted a major share of their time to studies of wildlife in forests of various types. One problem of major concern is the establishment of guidelines for timber-stand improvement. Recent research has shown that hardwoods contribute substantially to the supply of game food through mast production; thus, timber-stand improvement aimed at eliminating hardwoods in pine forests may work hardships on wildlife resources. This is but one of the problems faced by wildlife research in cooperation with the U. S. Forest Service.

GAME MANAGEMENT

Cooperators in the extensive waterfowl breeding ground surveys and banding program this year included 11 State game departments, 5 Provincial game departments, Ducks Unlimited, the Wildlife Management Institute, and the Canadian Wildlife Service. Other projects included the midwinter waterfowl population survey, the Post Office hunter kill survey, and winter banding; in varying degrees, the same cooperators took part.

Further cooperative endeavors were carried out with the individual flyway councils, and the National Flyway Council. Service representatives and representatives of flyway councils began preparation of long-term waterfowl-management plans for each flyway. This is the initial step toward continental management plans.

Again this year, meetings were held in May and June with flyway councils to review the regulatory program of the Service. These meetings are helpful in developing public understanding of the Service's functions as they relate to regulations.

In 1954 the Fish and Wildlife Service instituted two separate undercover programs, one in Texas, the other in Maryland. A third program manned and financed jointly by the Federal Government and the State of Tennessee was instituted in 1955. All three were brought to a successful conclusion in 1956.

The Tennessee operation resulted in apprehension of 28 market hunters, who had been commercializing in waterfowl in the vicinity of Reelfoot Lake. Fines and sentences imposed were $3,458.50 and 922 days in jail. The Texas program culminated in the greatest roundup of market hunters in the history of game-law enforcement in this country, when United States game-management agents assisted by United States marshals and State wardens arrested 44 market hunters; subsequently, warrants were issued for the arrest of 10 more. Shortly after the Texas roundup, 6 Maryland residents were arrested and charged with market hunting as the result of evidence obtained by a Service undercover operative.

During the year, 209 cases involving violations of the Alaska Game Law were concluded, with 153 convictions, 2 dismissals, 4 acquittals, and 50 cases concluded by seizure of contraband articles without further action. Five cases were pending at the end of the fiscal year. In addition to the Alaska Game Law violations, 6 Alaskan cases (5 convictions and 1 acquittal) involved violations of the Migratory Bird Treaty Act, and 4 (all convictions) involved violations of the Migratory Bird Hunting Stamp Act. Fines aggregated $14,566 (of which $3,468 were suspended); jail sentences totaled 1,445 days (of which 1,260 were suspended). Seizures included 49 firearms, 31 traps and snares, 4 game birds, 56 fishes, 66 game animals, 43 skins of fur-bearing animals, 1 shotgun, 6 bear hides, 1 mountain-sheep head, and 84 hunting and fishing licenses.

Game-management agents of the Service continued to assist law-enforcement officers of other Federal agencies and State agencies responsible for fish and game conservation. Game-management agents (acting as deputy State game wardens) individually, or in cooperation with State game law enforcement officers, assisted in the apprehension and conviction in State courts of 4,444 persons charged with violations of State game and fish laws, resulting in the imposition of fines and costs aggregating $146,847.54 (of which $3,703 were suspended). Jail sentences aggregated 3,795 days (of which 3,110 days were suspended), while probationary sentences were imposed aggregating 227,820 days. Of these cases, 2,368 involved unlawful taking of migratory birds and interstate shipment of game animals and fish, which were subject to prosecution in Federal courts.

Assistance by Service agents to other agencies responsiblefor management and protection of wildlife resources frequently involves them in unusual situations. Such a situation arose this year, when a Service agent provided evidence to convict an individual who was fined $80 by the Yakima Indian Tribal Council for killing two deer on the Yakima Indian Reservation, Wash., during closed season. In international cooperation, game-management agents of the Service furnished evidence seized in the State of Washington which led to the conviction of a United States citizen in Canada for unlawfully killing and exporting a Rocky Mountain sheep; he was fined $550.

Under regulations pursuant to paragraph 1518 of the Tariff Act of 1930, as amended by the act of July 17, 1952 (66 Stat. 755; 19 U. S. C. sec. 1001, par. 1518), 18 permits were issued to authorize the entry, under quota, of skins bearing feathers of certain species of foreign wild birds. Imports consisted of 2,141 pheasant skins and 1,704 grey jungle fowl skins. The skins of the grey jungle fowl were for use in the manufacture of artifical flies for fishing, while the pheasant plumage lawfully may be used for millinery as well as for fishing flies.

Table of cases disposed of in Federal courts (exclusive of Alaska) involving violations of wildlife-conservation laws administered by the Fish and Wildlife Service, fiscal year 1956

	Pending July 1, 1955	New cases	Pending June 30, 1956	Terminated	Fines and costs	Jail sentences (days)	Probation (days)
Migratory Bird Treaty Act	[1] 381	1,076	218	1,239	$65,536	4,784	20,584
Migratory Bird Conservation Act	[1] 41	41	9	73	1,190		144
Migratory Bird Hunting Stamp Act	[1] 18	76	16	78	1,832		
Lacey Act	1	1		2	100		
Assault Act	5	6	2	9	350	690	2,190
Black Bass Act		1	1				
Northwest Atlantic Fisheries Act	5			[2] 5			
Bald Eagle Act		2	1	1	25		
Total	451	1,203	247	1,407	[3] 69,033	[4] 5,474	22,918

[1] The disparity between the number of cases shown in last year's annual report as pending June 30, 1955, and that shown as pending this fiscal year results from differences noted between records maintained in the Central Office and the regional offices of the Service. Future tabulations will be based upon data obtained from regional offices which possess more current information and hereafter will have sole responsibility for maintaining statistical records of this nature.

[2] These cases were dismissed because of insufficient evidence.

[3] Includes $12,775 suspended.

[4] Includes 2,917 days suspended.

CONSERVATION OF ALASKA WILDLIFE RESOURCES

A big problem in Alaska game and fish management is to find ways of distributing hunting and fishing pressure to avoid depletion in accessible areas and achieve proper utilization elsewhere. Inadequate harvesting can result in economic loss of fish and game resources and in long-term reduction in the carrying capacity of a range. Regulations are aimed at encouragement of hunting and fishing pressure where greater utilization is desirable. While curtailments have been required in populated and readily accessible areas, regulations in most of the Territory have been liberalized as a result of a better understanding of population dynamics. Research is paying off in a way that hunters and fishermen can appreciate.

Sport fishing, as measured by recent economic surveys by the University of Alaska, is already a multimillion-dollar annual business in the Territory. The Service is attempting to gear game-fish management in Alaska to natural production rather than depend on artificial propagation. Lake and stream surveys have preceded stocking and transplanting operations in an effort to match habitat with species. It is recognized that maintenance stocking may be required to support heavy local fishing pressures, but emphasis has been on stocking areas capable of natural reproduction. Studies are underway to determine feasibility of fish food and environment manipulations to increase natural production.

An increased waterfowl-investigation program is providing much information on Alaska's contribution to the various flyways of the United States. Breeding-pair surveys, brood counts, winter inventories, habitat studies, and banding programs are developing needed information on migratory-bird production. Absence of droughts or other unusual conditions makes Alaska a prime and dependable producer of waterfowl. Key nesting and concentration areas are being selected for inclusion in the Nation's waterfowl network. Protection of habitat is of prime importance; industrial developments, particularly oil production, must be accomplished in a manner designed to safeguard vital nesting and feeding areas. With proper planning, this appears to be entirely possible.

Improvement of winter feeding grounds on the Kenai National Moose Range is receiving priority attention. Once an economically sound method is found to replace evergreens with willows, winter habitat manipulation may be extended to other critical areas. Work in this field has been so restricted by lack of funds that we are in danger of losing a portion of the tremendously valuable Susitna Valley and Kenai Peninsula moose herds. Present populations cannot be maintained unless we are able to make up for habitat losses due to settlement and replacement of willows by succession of spruce forests. These lands are chiefly valuable for moose production.

Modern tools and techniques are available to continue and possibly improve wildlife production in Alaska. The future of these resources may well hinge on our ability to help guide multiple land use practices in the next few years.

RIVER BASIN DEVELOPMENT AND WILDLIFE NEEDS

Of 344 reports this year by the Service on water developments planned by Federal agencies or by other interests under Federal permits, 131 were on Corps of Engineers projects, 58 on Bureau of Reclamation, 100 on Department of Agriculture, 39 on power projects requiring license from the Federal Power Commission, and 16 were special and miscellaneous studies.

Outstanding among fishery accomplishments relating to water developments was the completion of a fish hatchery at the Bureau of Reclamation's Nimbus Dam on the American River in California, to compensate for the loss of salmon-spawning areas. A fishway was constructed at Prosser Dam and two new fish screens were placed in operation in the Chandler Canal as part of the fish and wildlife developments planned for the Kennewick division of the Yakima project in Washington. Another fishway at Prosser Dam and a wildlife-protective fence along the main canal will be constructed in the near future.

Service technicians worked on problems pertaining to passage of salmon and other anadromous fish at Mayfield Dam on the Cowlitz River in Washington, at Pelton Dam on the Deschutes River and North Fork Dam on the Clackamas River in Oregon, at Rocky Reach, Priest Rapids, and The Dalles Dams on the Columbia River, and at Ice Harbor, Mountain Sheep, Pleasant Valley, Brownlee, Oxbow, and Hells Canyon Dams on the Snake River.

A Conservation Service award of the Department of the Interior was presented to the Holyoke Water Power Co. of Massachusetts for its mechanical-hoist fishway at South Hadley Falls Dam on the Connecticut River. This facility aided the passage of approximately 7,700 shad in the spring of 1956, the largest number to reach the upper river since the dam's construction in 1849.

The nationwide economic survey of hunting and sport-fishing activities, initiated last year, was completed with the exception of final analysis and review. The Service expects to release the findings of the survey in September 1956. This survey was selected by the Bureau of the Budget as one of two surveys by the United States Government recommended for inclusion in a publication of the United Nations on sample surveys of current interest conducted by various governments.

In line with the Coordination Act of 1946, plans were completed for use of six water-development areas for wildlife management. These are Albeni Falls Reservoir in Idaho, Old Hickory Reservoir in Tennessee, Clark Hill Reservoir in South Carolina, Fort Randall Reservoir in South Dakota, Alcova Reservoir in Wyoming, and the Humboldt Project in Nevada. Agreements between the Departments of the Army and Interior were completed for the McNary lock and dam project in Oregon and Washington and the Snake Creek Arm of Garrison Reservoir in North Dakota, to make lands available for wildlife purposes.

Construction of six large Federally financed impoundments on the Missouri River mainstem, one of which will be larger than all the TVA reservoirs combined, is creating new fishery-management opportunities and responsibilities. Federal-State cooperative studies should be activated promptly if the enormous recreational and commercial fishing potential of these waters is to be realized.

The huge Upper Mississippi River navigation pool system, 900 miles long, has created many fishery problems, solution of which is considered very important by the five States on its border. In response to their request, the Service has designated a fisheries-survey director to coordinate a cooperative program of fish-management studies on the river.

Soil-bank program committees were established in the central office and in each of the regional offices to consider Service responsibilities, and means for implementing fish and wildlife conservation measures, in the program.

Results of a 4-year study of the relation between duck production and drainage in the pothole regions of North Dakota, South Dakota, and Minnesota were published as Special Scientific Report—Wildlife No. 32, Duck Production Studies on the Prairie Potholes of South Dakota. The inventory of marshes, swamps, and seasonally flooded lands has been summarized nationally and will be released in July as Circular 39, Wetlands of the United States. The followup inventory of permanent lakes, streams, and reservoirs of importance to waterfowl is nearing completion. These three studies provide long-needed information for planning a program to preserve and develop waterfowl habitat.

In connection with the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress), the Service has investigated and written reconnaissance reports on 80 small-watershed projects sponsored by the Soil Conservation Service. Of these, four projects were expected to be harmful to fish and wildlife resources, and detailed studies were made to recommend measures that would mitigate the detrimental effects.

Fish and wildlife development plans were prepared for specific areas as part of the Department's Garrison Diversion Project in North Dakota, and an area was tentatively selected to replace the portion of the Lower Souris National Wildlife Refuge which will be affected by this project.

A special report on the Upper Klamath Basin was prepared to show the importance of this area to waterfowl and to help resolve conflicts in the status of lands and waters.

Studies of the fish and wildlife resources of the Rogue River Basir were completed and a report was written showing the great importance of these resources.

In Alaska, studies continued on the Copper, Susitna, and rivers oi the Kenai Penninsula in connection with proposed dams; and studies were inaugurated on the Yukon River. Several power projects on smaller streams were also investigated.

FEDERAL AID

Fish Restoration

This marks the completion of the first 5 years of the Dingell-Johnson fish-restoration program. In this short time, major contributions have been made to the Nation's sport-fish resource. Many new lakes have been built, access to lakes and streams has been provided, poor fishing lakes have been rehabilitated, and investigations have shown the way to better management.

Investigations during the fifth year of the program placed increasing emphasis on experimental management, evaluation and development of techniques, and studies of specific problems. Benefits of fish-population manipulation in certain streams have been determined, and the development of the most effective stocking methods continued. Other experimental management projects included habitat alteration, introduction of game and forage fish, commercial-fishing studies, and evaluation of fishing regulations.

In recognition of the need for selective control of rough fish, investigations were conducted to determine the effect of various poisons and to develop practical means for application. Studies were carried on to develop new selective fishing equipment and means for destroying undesirable fish spawn.

Sampling of inland and marine fish populations, life-history studies, selective breeding of hatchery stock, disease and nutrition studies, pollution investigations, as well as migration and harvest studies, are typical of the studies carried on in the past year.

Creation of new fishing waters was emphasized by 17 States in which 23 lakes, with a total of 1,850 acres, were being constructed. Located near population centers, these new lakes will help fill an urgent need for places to fish. Activities designed to improve stream habitat were undertaken on 8 streams in 5 States. These included streambank protection, gully control, tree and shrub planting, fencing, channel improvements, and barrier removals.

Twelve States undertook to remedy stunted game and overpopulations of trash fish by chemical treatment of lakes totaling over 14,000 acres. In Alaska and 14 States, public-use facilities such as roads, parking lots, and boat ramps were installed to improve accessibility to lakes and streams and to increase utilization of resources.

Other program-financed activities included construction of fishways over stream obstructions, making accessible many miles of spawning grounds, and rotary and stationary screens, some to prevent fish from leaving lakes, others to prevent reinfestation by trash fish. Over 6,300 acres were acquired and nearly 57,000 acres leased by 19 States for lake sites, for fisherman access, and for spawning areas. In addition, over 10,600 acres were purchased for combination fish and wildlife areas.

Wildlife Restoration

Of special significance during this year was the amendment of August 12, 1955, to the Pittman-Robertson Wildlife Restoration Act. This provided for the apportionment, in five equal annual installments, of unappropriated $13,500,000 of sporting arms and ammunition excise tax collections that had accumulated prior to 1947. It also broadened the base of authorized restoration operations to include wildlife-management activities.

Program work followed the general pattern of other years, with greater emphasis on restoration of wildlife habitat. Waterfowl-management activities again received a large share of the States' developmental budget. Forty-four had over 150 projects approved which were designed to create new habitat for ducks and geese and to carry on the annual operations necessary to keep previously developed areas at a high level of production. A number of States built water-control structures to create marsh and shallow-water areas ranging in size from a few to many hundreds of acres. Maintenance of dams, manipulation of water levels to increase natural waterfowl foods, and farming operations to supplement the wildfowl diet required substantial effort. Muskrats, pheasants, and rabbits also benefited from these improvements.

Habitat manipulation for upland game on State owned or leased areas increased the food supply and provided sorely needed winter range for elk, antelope, deer, and other big game in the West, and whitetailed deer and turkeys in the East. Dividends accrued to many other species from these activities.

Thirty-four States expended over $2,500,000 on the improvement of farm-game habitat by tree, shrub, and herbaceous plantings on lands of cooperating farmers.

Trapping and transplanting antelope, deer, bighorn sheep, mountain goat, moose, wild turkey, snowshoe hare, and marten into suitable but vacant range was conducted by 16 States and Alaska.

As a result of legislation permitting expenditures for management, greater provision was made for public use of game-management areas. The newly authorized work included access roads, parking areas, and sanitary facilities which made it possible to more adequately handle hunter-use problems.

Lands bought for big-game ranges and waterfowl and upland-game management areas nearly doubled in acreage during the year. Over 135,000 acres were approved for purchase and an additional 114,000 acres were leased by 32 States.

Forty-four States, Alaska, Hawaii, Puerto Rico, and the Virgin Islands sought answers to their wildlife problems through investigational projects. Prominent in these studies was the gathering of population data, reproductive success, and harvest information. These data provide important guidelines in setting seasons and bag limits and in determining hunter success.

Cooperative interest in the continental waterfowl situation was exemplified when 15 States sent 24 biologists to the Canadian breeding grounds to study production and band waterfowl to learn more of their migratory movements. The advantages of cooperative effort were demonstrated by joint efforts of various State groups in solving common waterfowl, dove, woodcock, deer, antelope, and bighorn-sheep problems.

A total of 541 exotic game birds from the Far East were imported by 4 States.

Publication of project findings is the most effective method of disseminating important results to other workers with similar problems. The results of Pittman-Robertson investigations were circulated in more than 400 published articles, bulletins, and books during the year.

PREDATOR AND RODENT CONTROL ACTIVITIES

Profitable conduct of agriculture, forestry, and other activities sometimes requires removal of animals that would otherwise interfere with resource utilization. Elimination of rats from grain elevators, reduction of coyotes on antelope fawning grounds, and protection of livestock from predators on national forests are examples.

Preventing damage and destruction of domestic foods and animal feeds by rats and mice has been greatly aided in recent years by anticoagulant poisons. Three of these, warfarin, pival, and fumarin, are licensed for commercial sale, and three others are being investigated by the Service. Despite great progress in rat and mouse control, there is still much to be done, particularly in guarding surplus grain stores from rodents; for example, at one point in Texas, 28 million bushels of wheat are currently stored in the open under canvas, which does not exclude damage and contamination by both rodents and birds.

Although excess numbers of most field rodents have not generally occurred for several years, there are signs of an upward trend. Jackrabbits are reported increasing in all the Western States except Arizona, Washington, and Oregon, and kangaroo rats have required control in New Mexico. New methods of controlling or repelling rabbits have been given field trials, particularly in Oregon and Washington, where the Service is working with foresters on methods of protecting tree farms. Two commercial products were tested and adopted for regular use in spraying nursery stock, and there are promising results from tests of new materials to control white-footed mice which prevent successful reforestation by direct seeding.

The recent upward trend in rodents is paralleled by increases in predators in the Western States, except Oregon and California, which reported no increases in coyotes but some in other predators, particularly bobcats. Alaska has reported a decided increase in wolves. These increases have occurred in spite of modern methods in predator control and reflect difficulties in extending limited Service facilities to cover widespread losses. Only through such techniques as airplane hunting, coyote getters, and compound 1080, has protection of game and livestock from predator attack been done as well as it has. Many sections are becoming so nearly urban that all hunting is prohibited, and species formerly classed as game or fur animals are now regarded as nuisance animals. Even in deserts and other relatively unoccupied places the current interest in uranium prospecting has greatly interfered with efficient control of predators, and in some instances has resulted in increased predation on game herds. Areas in Oregon and Nevada, formerly noted as among the best producers of antelope, have reported such great killing of fawns by coyotes as to keep the herds in a nearly static condition this year. On the other hand, in certain areas where control has been unhampered by competitive land use, antelope and other game have profited greatly by predator control. In Wyoming, the 1955 antelope harvest was 33,090 animals, about 3,000 larger than the average for 1951, 1952, and 1953. Taken as a whole, however, the Western United States has experienced increased damage to livestock and game from predators during the past year.

An unusual aspect of animal control has attracted attention in the Pacific Northwest where surplus numbers of bears have destroyed young timber. Another unusual situation is the control of coyotes preying on "weeder" geese in California. In the cotton-growing section over half a million geese are kept to weed the cotton fields. Protection of these birds from coyote depredations has become one of the newer Service responsibilities in resource conservation.

An activity directly related to human welfare is rabies control in wildlife, particularly in foxes. The Service has continued to work closely with States and counties throughout the East where fox populations have been high for a number of years. The Service has also cooperated with the Public Health Service in studies of rabies among bats in Texas and other States as far north as Montana. As yet, there is little evidence of transmission of rabies from bats to man, although transmission to warm-blooded animals has been demonstrated in the laboratory. For the country as a whole, there was a slight decrease in the amount of rabies among wildlife, but trouble spots continually appear, and certain areas in New York, Georgia, and Texas continue chronic despite preventive efforts.

Cooperative predator and rodent control operations during the year entailed expenditures of $968,185 from regular departmental appropriations, supplemented by $1,474,143 from cooperating States and $3,374,520 from cooperating counties, livestock associations, and others. The recorded catch of predatory animals by Service and cooperative personnel was 55,402 coyotes, 2,036 wolves, 19,495 bobcats and lynx, 984 stock-killing bears, and 285 mountain lions. In rodent control operations, 10,546,930 acres of land were treated for elimination of prairie dogs, ground squirrels, pocket gophers, jackrabbits, field mice, cotton rats, kangaroo rats, porcupines, woodchucks, and moles. In addition, 344,702 premises were treated in cooperative campaigns for the control of rats. Special equipment and supplies used in both predator and rodent control, and 229,820 pounds of rodent-bait materials, were distributed by the Service's supply depot at Pocatello, Idaho.

INTERNATIONAL COOPERATION IN CONSERVATION

International Technical Cooperation

The Fish and Wildlife Service continued to assist the International Cooperation Administration in providing technical aid to friendly nations. Fishery-development projects were carried out in El Salvador, Peru, Bolivia, Liberia, Pakistan, India, Thailand, Viet-Nam, and Indonesia. The Service provides technical information, helps recruit competent technicians, and supervises instruction of foreign students in the United States.

An excellent example of success in developing a natural resource is the marine project in Liberia, where, it appears, the annual landings in 1954 and 1955 were at least 10 times greater than in prior years. The increase resulted primarily from the operation of large trawlers brought in from Europe. Facilities for better handling and distribution were put into operation, making it possible for inland areas to obtain marine products with their high content of proteins, minerals, and vitamins.

The training of foreign students in the United States is an important part of the assistance program, producing competent technicians who can continue developmental projects. This year, 12 students from 7 countries received valuable instruction. In addition, many visitors from abroad were given opportunities to visit persons and places of interest in connection with fish and wildlife resources.

International Conservation Agreements

The Service participated in the activities of a number of international fishery organizations and in several international conferences of importance.

The work of the International Pacific Halibut Commission and the International Pacific Salmon Fisheries Commission continued, with gratifying results. Good catches of halibut and Fraser River sockeye salmon once again demonstrate the excellence of these two fishery-management programs. As the result of expanded investigations, the Inter-American Tropical Tuna Commission has found tentatively that the stocks of yellow-fin and skipjack tunas which support the United States tuna industry have been fished during the past year at a level below the maximum sustainable yield and that at present there is no danger to these stocks from overfishing.

The International Whaling Commission and the Indo-Pacific Regional Fisheries Council both met during the year. Encouraging progress has been made in the development of techniques for the study of distribution and migration of salmons, by Canada, Japan, and the United States under the auspices of the International North Pacific Fisheries Commission.

The highlight of the activities of the International Commission for the Northwest Atlantic Fisheries was a meeting of scientists from the 10 member nations, in Biarritz in March 1956. This meeting contributed significantly to the solution of the complex problem of coordinating the research efforts of 10 governments. The Commission itself held its sixth meeting in Halifax in June 1956.

In April 1956, representatives of Canada and the United States met for the organization meeting of the Great Lakes Fishery Commission, established in accordance with a Convention signed by Canada and the United States in September 1955. The Commission will concern itself with the solution of important fishery problems in the Great Lakes, including control of the sea lamprey.

Representatives of the Department participated in the Santiago Negotiations on Fishery Conservation Problems, September 1955, in the Specialized Conference of the Organization of the American States on the Conservation of Natural Resources at Ciudad Trujillo, Dominican Republic, in March 1956, and in the North Pacific Fur Seal Conference, which convened in November 1955 and was still in session at the end of the year.

CONSERVATION INFORMATION AND EDUCATION

In activities directed at conservation of the public's natural resources, nothing is more important than public understanding and cooperation. To gather and disseminate information was a basic function of each of the predecessors of the Fish and Wildlife Service and has continued as a vital function of the Service. The Fish and Wildlife Act of 1956 includes provisions that place added emphasis on "investigations, information, reports."

During the year, the Service publicized the findings of research and other information on fish and wildlife through 12 publication series and 6 periodicals. Publications included technical reports of scientific investigations, compilations of fish and wildlife statistics, public announcements concerning regulations, informational pamphlets on wildlife refuges, fish hatcheries, and other Service establishments, and popular informational and advisory booklets on fish and wildlife conservation.

From the 10 million young people in organized youth programs, as well as from many of the rest of the 35 million school-age children, there is a steadily increasing demand for informational materials and advice on the conservation of natural resources, including wildlife. The Service was able to contribute substantially to cooperative conservation-education programs for youth, and particularly to the national conservation program of the Boy Scouts, even though only about half the time of one member of the Division of Information could be given to this important phase of conservation.

Although there is no general public distribution of Service publications, approximately 75,000 specific inquiries were answered by the publications-distribution unit. There was an increase of more than 50 percent in the supplying of current information about fish and wildlife utilization and conservation to newspapers and other informational media. In visual information, 11,000 photographic prints were supplied in the last calendar year in answer to requests from publishers and conservation agencies. About 6,250 requests were received for the loan of Service motion pictures; 450 of these could not be filled because all available prints were in use. The Service produced several television shorts promoting the conservation of fish and wildlife, such as the "Save the Whoopers" short, of which 86 copies were distributed to midwestern television stations.

Tentative specifications were drawn up for information and education organizations for each of the Regional Offices of the Service.

THE NATIONAL PARK SERVICE

Conrad L. Wirth, *Director*

THE most important facts of the 1956 fiscal year, from the standpoint of the National Park System and the National Park Service were the completion of the Mission 66 report, its hearty endorsement by the President and by the Congress, and the launching of the Mission 66 program with an increase of $19,153,700 in the Service's appropriation for the 1957 fiscal year. This annual report offers a welcome opportunity to express appreciation of the warm support and backing extended to Mission 66 by former Secretary of the Interior Douglas McKay, by his successor, Secretary Fred A. Seaton, and by officials throughout the Department.

Particularly heartening was the instant favorable response of President Eisenhower when the Department and the Service had the extraordinary experience of presenting the essence of Mission 66 to the President and his cabinet. Tremendously encouraging, too, was the interest in this project displayed, even long before the report was finished, by members of the House and Senate, without regard to party affiliation, and the eagerness of the Congress to provide such funds as could be effectively used to launch the Mission 66 program.

It cannot be stressed too often that Mission 66 is a 10-year conservation program for the National Park System. Its whole purpose is to make possible the best and wisest use of America's scenic and historic heritage. That means maximum enjoyment with maximum protection of those features and those qualities which make it, as Time Magazine recently expressed it, "the U. S.'s unmatched National Park System." True, accomplishment of the program requires large amounts of construction, but these are simply the necessary means by which to accomplish its conservation objective. Equally a part of the program is the provision of services, adequate in kind and quality to meet the legitimate requirements of 80 million or more visitors in 1966. The maintenance of an enlarged physical plant, the provision of services for constantly increasing numbers of visitors, and protection both of parks and people are the reasons why estimates for management and protection, and for maintenance and rehabilitation, show proposed increases in these items from the $11,562,000 and $10,158,000 allowed for 1957 up to $19,990,000 and $14,000,000 for 1966.

National Park Service programs in the past have been year-to-year programs. It is hoped that there will be such Congressional and public acceptance of Mission 66 as a 10-year program which must be carried through to completion as will permit the Service to operate, and to go forward with construction, in a manner predicated on its long-range character. It is particularly important that it be accepted in terms of specific things to be accomplished rather than in terms of estimates of cost.

Specifically, the Service hopes now to be able to proceed with development on a full-scale, rather than a piecemeal, basis. Not only will this make possible much more economical expenditure of construction funds but it will shorten, for each area being developed, the period of disruption which always comes with construction activities.

The preparation of designs for the greater amount of construction ahead, and proper supervision of construction, combine to pose a serious problem. It has been particularly difficult to recruit fully the professional staffs needed for the expanded 1956 construction programs and for the surveys and planning required for the more comprehensive program of Mission 66. The various steps taken to solve the employment problem include contracting with private engineering and architectural firms for the preparation of plans and for the supervision of construction. The Service is deeply grateful to the Public Health Service for the increased engineering services which it has made available.

Eager as the National Park Service is to obligate the increased construction funds made available to it, its first responsibility is to make certain that overall developments are soundly planned, that design for structures is fully acceptable, and that it gets, in return for its construction dollars, 100 percent of what it pays for.

Concessioner Developments

The past year has been marked by a major change and a long step forward in the direction of concessioner provision of overnight lodging and other facilities needed in a number of national parks. On June 25, brief ground-breaking ceremonies officially launched the construction of the new Canyon Village, in Yellowstone National Park. This project, situated comfortably back from the rim of the Grand Canyon of the Yellowstone, will replace the older and outmoded facilities which encroached on the rim, and will provide more and better facilities to meet the demands of increased travel.

Last year's opening of Jackson Lake Lodge, at Grand Teton National Park, is being followed by an extensive cabin development, with appurtenant facilities, which will serve campers and day visitors as well, at Colter Bay, all undertaken with funds supplied by Jackson Hole Preserve, Inc.

The million-dollar Yosemite Lodge project at Yosemite National Park; extensive capital improvements by Fred Harvey on the South Rim, at Grand Canyon National Park, with more in prospect; the near-completion of the Marine Service building at Flamingo, in Everglades National Park; and improvements by concessioners at Glacier and Shenandoah National Parks are all noteworthy steps toward the provision of more nearly adequate facilities in areas where they are needed and justified.

The Director decided against the provision of overnight facilities at Flamingo, convinced that space there was too limited to make them desirable and that they can be satisfactorily provided by private enterprise outside the boundaries of Everglades. Decision on relocation of overnight facilities at Mesa Verde National Park and Mount Rainier National Park awaits further study.

JAMESTOWN, WILLIAMSBURG, AND YORKTOWN

Next year is the 350th anniversary of the establishment of Jamestown; approximately halfway between 1607 and the present, the victory of French and American forces at Yorktown assured American Independence; and Williamsburg, lying between the two sites which are both parts of Colonial National Historical Park, witnessed the ripening of the culture of the colonial and early national period. For the celebration scheduled there next year, the Service will have anticipated mission 66 by completing the Colonial Parkway, extending from Jamestown through Williamsburg to Yorktown; by the construction of new visitor centers at Jamestown and Yorktown; and by other developments which should add greatly to visitor enjoyment and to appreciation of the Nation's historic past. Nearly all these developments were under contract before the past fiscal year ended. In addition, the glassworks at Jamestown, restored through the generosity of Jamestown Glasshouse Foundation, Inc., was nearly completed, and will be in actual operation during the 1957 celebration and thereafter.

Marks of Progress

Of the many events and developments of the past year described hereafter in more detail, brief notice is directed to some of the most noteworthy:

The donation, for the second successive year, by Jackson Hole Preserve, Inc., of $500,000 to match an equal amount of appropriated money for land acquisition;

Increasing stress on more, and more effective, training for Service personnel;

Extension of self-guidance activities, advances in the use of audiovisual facilities, and other extensions and improvements in the Service's interpretive program;

Reestablishment of the position of Associate Director of the National Park Service, and appointment to it of a career employee of long experience.

Public Relations

That there is a vast reservoir both of interest in and good will toward the National Park Service and the National Park System was abundantly shown in the response, by individuals, organizations, newspapers and magazines, to mission 66. Without doubt, nothing has contributed more to that public attitude than the courteous and conscientious performance of their duties by the men and women who represent the Service in the field. Nor is anything more essential to the successful accomplishment of mission 66 than the continuance of such service, and the maintenance of friendly and understanding relationships with the communities which, because they are neighbors, have a legitimate degree of special concern with the welfare of individual units of the System.

In order to promote this valuable relationship with area neighbors, the Service has suggested and urged all field areas to "invite the neighbors in" for three anniversary observances annually, these being Founders' Day (August 25), the date on which the law establishing the National Park Service was approved; Campfire Day (September 19), the day of the famous Yellowstone Campfire of 1870 at which Judge Cornelius Hedges urged establishment of the world's first national park; and Establishment Day, the anniversary date of the establishment of the area holding the observance. Though newly instituted, this procedure has already proved highly valuable, not only in cementing important local relationships, but also in bringing certain fundamental facts and concepts to large numbers of visitors in an effective way.

Heightened public interest in the National Park System during the past year has had a number of noteworthy results. At the end of the year both Time and Newsweek had under preparation feature presentations dealing with the System and with those problems toward the solution of which Mission 66 is directed. Probably the outstanding journalistic contribution to public understanding of the parks was the 30-article series (to appear, with some modification, in book form) which appeared during the winter and spring in the Christian Science Monitor. These were written by Max Gilstrap, a former National Park Service employee, who brought to his task the understanding, the detachment, and the independence of judgment and opinion needed to make the series exceptionally thought provoking.

In connection with these projects, with the Sinclair Oil Corp. series of advertisements which have continued to feature many areas administered by the National Park Service, and with numerous other similar undertakings, it has been the pleasant privilege of the Service to serve as a source of information and, in some cases, as a checking point for factual accuracy.

Through representation on both its Advisory Council and its Steering Committee, the Service has worked closely throughout the year with Keep America Beautiful, Inc., the organization which is supported by those industries whose products tend ultimately to contribute to the litter along the Nation's highways, as well as along park roads and trails and at parking areas and observation points. With strong promotion by KAB and numerous other organizations associated with it, the use of the litterbag, first distributed at Mount Rainier National Park in 1951, has become tremendously widespread. Since litter is one of the major maintenance problems of the Service, participation in this well-organized effort to reduce it is considered both good public relations and good economy.

Changes in Advisory Board

With the expiration of the 6-year terms of Alfred A. Knopf and Charles G. Woodbury as members of the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments, their places were filled by the appointment of Frank E. Masland, Jr., of Carlisle, Pa., and Fred Smith of New York City. Mr. Masland, head of the rug manufacturing firm of C. H. Masland & Sons, Inc., has long been a student of the national parks and their problems. Mr. Smith is president of Fred Smith & Co., Inc., public relations counselors, and is a member of the executive committee of the Council of Conservationists. Both new members have a broad business background.

The two retiring members have given devoted and intelligent service. Mr. Knopf was for 2 years chairman of the Board and provided exceptional and courageous leadership.

At its spring meeting, the Board chose Walter L. Huber of San Francisco to succeed Mr. Knopf as chairman.

In July 1955, John B. Oakes, of the editorial board of the New York Times, was appointed to the Board to succeed the late Bernard

De Voto. Mr. Oakes has written extensively and effectively about national parks and conservation in general.

National Park Service Conference

"Public Services" was the theme of the servicewide conference at Great Smoky Mountains National Park last September. It was attended by nearly all superintendents and by numerous representatives of the Washington, Regional, and Design and Construction offices. Delayed from 1954, it was considered one of the most successful in the Service's history.

Former Secretary Douglas McKay was the principal speaker at the banquet which wound up the conference. His address was directed chiefly to superintendents and dealt largely with their responsibilities for the training and advancement of their subordinates.

Region Five Established

Effective on July 1, 1955, the 4 regions which had existed since 1937 became 5 when Region Five was established with headquarters in Philadelphia. Daniel J. Tobin became its first regional director. Tobin's career began as a clerk at Sequoia National Park in 1921. It encompasses a wide range of steadily increasing responsibilities in various field positions.

The new region includes 16 States in the Northeast and Middle West, extending west to include Isle Royale National Park in Michigan. Most of the area was formerly part of Region One, though Isle Royale was subtracted from Region Two. At the same time Arkansas, containing Hot Springs National Park, was transferred from Region Three to Region One.

The new regional director entered on duty on July 1. By September 1 enough key personnel had reported for duty so that the new office fully was able to assume its responsibilities.

Big Bend National Park Dedication

Originally planned at least four years earlier, the long awaited dedication of Big Bend National Park took place on November 21, 1955.

After the disappointments and postponements of previous years the Big Bend National Park development committee, headed by Paul Forchheiner of Alpine, resolved there would be a dedication in the fall of 1955. In August plans were still indefinite and it was not until October 24 that a date was established and a commitment received from Secretary of the Interior Douglas McKay that he would make the dedicatory address.

Eleven hundred persons attended the dedication ceremonies which were held in The Basin. Among the distinguished persons who participated were Assistant Secretary D'Ewart, Governor Allan Shivers of Texas, and Representative J. T. Rutherford. The Director of the National Park Service was also present and was one of the speakers. An international touch was lent by the presence of the Governor of Chihuahua, Mexico, Sr. Lozoya Solis, and the Consul General of Mexico, Sr. Enrique Ballesteros, on the speakers' stand, with the flag of Mexico flying alongside the Stars and Stripes.

Special Commissions

The Director concluded his services as Executive Officer of the John Marshall Bicentennial Commission, which held its national celebraion honoring the 200th anniversary of the birth of Chief Justice Marshall and also published a final report on its activities. The Woodrow Wilson Centennial Commission, of which the Director was also Executive Director, sponsored a series of nationwide observances ommemorating the birth of President Wilson. In September 1955 he Boston National Historic Sites Commission, of which the Director s a member, undertook its studies of Colonial and Revolutionary eriod properties in Boston and vicinity. The New York City National Shrines Advisory Board began its program to promote ublic cooperation and support in rehabilitating and preserving Federal Hall National Memorial and Castle Clinton and Statue of Liberty National Monuments.

Antiquities Act Anniversary

June 8, 1956, was the 50th anniversary of the passage of the act for he Protection of American Antiquities, more generally known as the Antiquities Act of 1906. Section 2 of that act authorized the Presient of the United States to establish national monuments on lands wned or controlled by the Federal Government, by Presidential roclamation. The first national monument established under uthority of the act was Devils Tower, in northeastern Wyoming, roclaimed on September 24, 1906. The anniversaries of the passage f the act and of the establishment of this monument have been celerated in Wyoming in a series of events which started in June and hich will extend through September 24. Early in June the Postaster General announced that a commemorative stamp would be ssued for Devils Tower.

Jamestown, Williamsburg, Yorktown Celebration

As an ex officio member of the Federal commission which is cooperating with a similar Commonwealth of Virginia commission in making preparations for the Jamestown, Williamsburg, Yorktown celebration in 1957, it has been necessary for the Director to attend numerous meetings of the commission in the area in which the celebration will take place. Anniversary observances are scheduled to begin on April 1 and to carry through November as planned by the Commonwealth and the United States Commission.

Mountain Climbing

Safety in mountain climbing continued to received attention with climbing and hiking organizations exerting considerable voluntary control over their members. The one fatality of the report year resulted from poor judgment and inexperience. Other accidents were infrequent. Contributing to the safety trend were the increased use of mountain climbing schools by visitors and an expanded mountaineering training program for National Park Service personnel.

Winter Use

As a result of important decisions made by the Secretary last year respecting winter use, new facilities were installed at Hidden Valley in Rocky Mountain and plans were completed for improvement of facilities for winter use of Paradise in Mount Rainier. The eight national parks open for winter sports received the heaviest winter use in their history—361,760 visitors as compared with 332,770 last year. About 40 percent entered the parks to participate in informal snow sports while 60 percent came to enjoy the winter scenery.

General Grant Tree Designated as National Shrine

After years of effort on the part of the people of Sanger, Calif., and particularly the American Legion post of Sanger, the act designating the General Grant Tree in Kings Canyon National Park as a National Shrine was approved by the President March 29.

Plans are underway for the dedication of the tree as a national shrin at ceremonies to be held at the site on Veterans' Day, November 11 1956.

Flood at Hot Springs

The second most disastrous flood ever to hit the downtown sectio of the city of Hot Springs and Hot Springs National Park occurre on February 15, 1956, following a rain storm in which 5.54 inches of rainfall were recorded during a 2-hour period. Basements of the bathhouses on Bathhouse Row and the Rockafellow Bathhouse were flooded, extinguishing the boilers and doing heavy damage to supplies which were stored in the basements. The bathhouses were unable to operate during 3 days. The floodwater receded and the litter was cleaned out in most of the houses within 24 to 36 hours. However, there was danger that floodwater had entered the central collecting reservoir from the three open springs in basements of bathhouses, so the reservoir had to be emptied and tests run for potability.

MISSION 66

The report for the fiscal year 1955 described the beginnings of Mission 66; the guidelines established for the studies on which its findings and recommendations were to be based; the invitation to all employees of the National Park Service to participate in it; the start made on correlation of their recommendations and of the prospectuses in which the needs of each field area were to be set forth fully.

The Mission 66 report was in approximately final form by the end of the calendar year; included in it, and derived from the prospectuses, of which the recommendations had been given a preliminary evaluation, was an estimate of the probable cost of so equipping and staffing the National Park System as to meet the needs of the 80 million visits expected in the year 1966, so that the 50th anniversary of the establishment of the Service might be fittingly celebrated.

On January 27, the Mission 66 program was presented, in word and picture, to President Eisenhower and his Cabinet, and was repeated immediately thereafter to the members of the White House staff. It was presented to the Congress on February 2, and was announced publicly at the Pioneer Dinner on February 8, jointly sponsored by the Secretary of the Interior and the American Automobile Association Congress appropriated the necessary funds to carry out the first year of the Mission 66 program.

The Service was fortunate in being able to present the Mission 66 story to the public through a handsome and colorful popular edition of the report, entitled "Our Heritage," which has been widely distributed. By this and other means, travel, conservation, recreation, scientific, and historical organizations and the press have been provided with information about the program as rapidly as it has become available. Much effort has been made to inform the press of the details of the program as rapidly as they could be made available. Public reaction from these groups and from many individuals and a great volume of editorial comment in newspapers and periodicals has been exceptionally favorable.

Only two significant areas of conflict have developed since the program was announced. These concern the location of accommodations in two of the national parks. It is fully expected that both of these will be resolved satisfactorily.

Park concessioners have been consulted about their participation in the Mission 66 program; notable improvements in and additions to accommodations are already underway and are planned in others in order to fulfill the purposes of the program. Several of those underway or completed are noted elsewhere in this report. While these projects started in advance of Mission 66, they are integrally a part of it, as will be those of the future.

Mission 66 has been widely characterized as the most significant undertaking of the National Park Service since its establishment in 1916. It seeks to provide for the most satisfactory enjoyment of the significant resources of the National Park System. The program calls for increased field staffs and increased annual operating funds, as well as a considerable amount of new development. Development is based on the assumption that when facilities are adequate in number, and properly designed and located, large numbers of visitors can be handled readily and without damage to the areas. Good development saves the landscape from ruin, protecting it for its intended recreational and inspirational values. It is the purpose of Mission 66 to locate developed areas where they will not invade the wilderness, impair fragile areas or features, or encroach upon significant exhibits. All development is based upon a well-thought-out plan for the protection and interpretation of the national and historic features of the areas. When these principles are followed, the development of a park contributes in essential ways to park conservation, while assuring the people of America, today and in the future, the opportunity to gain the fullest enjoyment of them.

A permanent staff has been established in the Washington Office of the Service to coordinate and continue the Mission 66 program.

Specific planning for individual areas, embodied in prospectuses defining the purpose, objectives, and plans for their management, development, protection and use, is almost complete. In accordance with the broad formulas defined in the prospectuses, detailed plans and construction drawings for those areas and projects to be programed in 1957, 1958, and 1959 are far enough advanced to insure prompt scheduling of the work.

Mission 66 Legislation

Three bills introduced in the 84th Congress—1 in the Senate and 2 in the House of Representatives—but not acted on before adjournment would have provided contract authorization, over a 10-year period, amounting to $160 million for roads and trails, the same amount for parkways, and a like amount for buildings and utilities and the acquisition of lands and water rights. In reporting on this legislation, the Department and the Bureau of the Budget recommended that it be changed to authorize appropriations in these overall amounts during the 10-year period, as well as $2 million for the construction of airports on lands in close proximity to areas administered by the Service. It was also recommended that the Secretary be authorized to obtain expert or consulting services without regard to limitations imposed by the civil-service and classification laws. The Subcommittee on Public Lands of the Senate Interior and Insular Affairs Committee held hearings on the Senate bill on June 8.

INTERPRETATION AND INFORMATION

Every area administered by the Service is the common property of every American, who has a right to know what he possesses, how his property is managed, and what use is made of it. When he himself becomes a user of it, it is natural and desirable that, his curiosity roused, he should seek to obtain some understanding of the natural processes which have produced a superlative example of his country's natural scene or of the human events and actions which have justified setting aside and displaying a site of historic or prehistoric interest. It has long been recognized as a Service obligation to both stimulate and satisfy this desire to know "Who?" and "When?" and "Where?" but even more important, "How?" and "Why?" It is felt to be the principal means by which the owners and users of the parks may derive from them deep and lasting satisfaction.

Rightly, and happily, Mission 66 takes full cognizance of the place of interpretive and informational programs in the management of the National Park System. Two of the eight major objectives make that plain. The third in the list reads: "Provide the services which will make the parks more usable, more enjoyable, and more meaningful, and thereby improve the protection of the park through visitor cooperation." While improved protection is a secondary result to be sought through a more effective interpretive and informational program, it is still one of great importance; in fact, it is essential, if the capacity of the System to provide enjoyment is to remain unimpaired. The connection of such a program with the preservation and use of wilderness areas is spelled out in the last of the list of objectives, which says: "Provide for the protection and preservation of the wilderness areas of the National Park System, and encourage their appreciation and enjoyment in ways that will leave them unimpaired."

Visitor Centers

Mission 66 recognizes that, with respect to both physical facilities and staffing, much more needs to be provided if users of the parks are to obtain the fullest measure of enjoyment and satisfaction from that use. The "visitor center" looms large in the program. This type of structure, of which about 100 are projected for the 10-year period of Mission 66, will serve both an informational and interpretive function. Situated as a rule in a center of visitor activity, its purpose will be both to provide needed information about accommodations, travel routes, park regulations, etc., and to supply some understanding of the character of an area and its significance. In its operation, not only a wide variety of physical aids—publications exhibits, recordings, to cite a few examples—but also competent personal services are required. Each will have to be "tailored" to the specific requirements of the area in which it is situated.

New Roads and Interpretation

The planning now underway in connection with the new east-side road at Grand Teton National Park typifies the new concept of wha a park road—in contrast with other types of roads—needs to be There and elsewhere interpretation—in the form of roadside exhibits signs, view-point turnouts, and markers—is being integrated with the other more usual phases of road construction.

Personnel Added

Material gains were made during 1956 in the direction of more adequate staffing, and both added facilities and the steady increase in public use will require considerable further additions during the 10 year of mission 66.

The establishment of Region Five required the services of both a regional chief of interpretation and a regional historian on th staff of the Regional Director; and a long-needed regional naturalis position was established and filled in Region One.

The year brought park historians, to both Harpers Ferry and Moun Rushmore, the first to be assigned to these two areas. Isle Royal and Hot Springs National Parks, and Colorado and Joshua Tre National Monuments, in all of which natural history figures importantly, now have on their staffs, also for the first time permanen park naturalists. In addition, three field teams of "museum planners," each consisting of a museum specialist and a naturalist or historian—all field positions—were established to develop, on the ground preliminary but detailed plans for museum exhibits. This is a par icularly necessary form of advance planning, in view of the consider- ble volume of museum and visitor-center construction envisioned luring the next few years and the need for new and up-to-date ex- ibit plans for museums whose content does not reflect present-day echniques.

nterpretive and Informational Services

That visitors to the areas administered by the National Park Service ppreciate the services rendered by interpretive personnel is indi- ated by the fact that so many make use of them. Conducted trips ere taken by 2,261,000 visitors; 5,340,000 attended informal talks iven by naturalists and historians. Hundreds of thousands of these ere school children, gaining a widened view of the natural world round them and of American history, of which they and all Ameri- ns are a part. Park museums and similar installations were used y more than 13,268,000 persons. All these involved some degree of ntact with and personal service from National Park Service per- nnel. Millions of other visitors used the roadside markers, the self- iding trails, and other aids to perception and understanding and sting enjoyment of their park experiences. Moderately increased affs made it possible to give more campfire and other talks and to nduct a greater number of trips. At the same time, the use of self- iding devices, and the installation of such devices, both increased.

elf-guidance

The evolution in interpretive methods employed by the Service dur- g the past decade has been strongly influenced by the fact that the ailable volume of personal services was increasingly inadequate r performance of the interpretive task, but it also reflects the devel- ment of improved audiovisual and other devices during that time, to hich the Service itself has contributed in notable fashion.

What is known as a self-guiding trail, or walk, started out to be a destrian route, along which signs or labels provided information out features of interest viewed from it; several of these remain in e in various areas of the National Park System. However, ordinary intenance costs for the signs, plus the habit of a small segment of sitors of making off with easily removable signs, led to the wide option of a different technique, requiring readily visible numbered kes along the way and printed or processed trail guides, keyed to em.

The issuance of self-guidance folders or booklets has become pri- rily the responsibility of the various official cooperating societies ich serve single areas or groups of areas. The past year has seen the issuance of a number of new self-guidance publications which meet high editorial standards and which reached a new high level of design and general appearance.

Historical, Archeological, and Natural History Research

To guide the development program underway at Jamestown, in anticipation of the 350th Anniversary Celebration at that site in 1957, the staff at Colonial National Historical Park completed important historical studies on tobacco cultivation, silkworm production, and colonial building construction. Archeological excavations at Jamestown revealed house foundations, including a row house, and many other objects of value in interpreting the Jamestown story. Archeological exploration on the Yorktown Battlefield uncovered the remains of historic Redoubt No. 10, a key outer defense of the British line captured by Washington's forces on October 14, 1781. It was in this fortification that Washington received and signed the articles of Cornwallis' surrender.

At Independence National Historical Park, Philadelphia, historical and architectural staffs concentrated upon studies related to restoring and refurnishing the first floor of Independence Hall. Such a study was completed during the year to guide the restoration and refurnishing of the Supreme Court Chamber. Special information for this study and other aspects of the restoration and refurnishing program was secured through the works of staff members in depositories from New York to California and in the archives in England

Continued use of cooperating agencies and collaborators to augment the efforts of Service personnel also made possible the accomplishment of many valuable geological and natural history studies. Among these were the start of a 5-year study of the general geology o Death Valley; glacial studies at Olympic, Glacier, Yosemite, Rocky Mountain, and Mount Rainier; completion of studies in geology history, and botany at Cape Hatteras; continuation of fish studie at Great Smoky Mountains, Shenandoah, and Yellowstone, and wildlife studies in Mount McKinley and Death Valley; and ecologica studies at Olympic, Sequoia, Yellowstone, Great Smoky Mountains and Big Bend.

Cooperative Studies

Archeological research of importance was performed by the University of Colorado, in Mesa Verde National Park; the University o Southern California, in Death Valley National Monument; Columbi

University, in El Morro National Monument; the University of Washington, in Olympic National Park; and the Florida State Museum, in Fort Caroline National Monument.

Salvage Archeology

Under cooperative agreements, archeological salvage work was performed by five local institutions, as well as the Smithsonian Institution. Groups from the University of South Dakota, the State Historical Society of North Dakota, and the University of Wisconsin worked in the Oahe Reservoir area, and from the University of Kansas and the Nebraska State Historical Society at Fort Randall Reservoir. The University of Missouri surveyed and partially excavated the Table Rock Reservoir area.

Using funds transferred from the Service, the Smithsonian Institution surveyed more than 100 sites, tested more than 40, and excavated 24 in 8 reservoir areas.

Foreign Studies

Dr. Charles W. Porter, III, represented the Service at the 6th International Castellological Congress in Montagnana, Italy, June 18–23, 1956. Also in June, Harold L. Peterson visited Sweden, Denmark, France, England, and Scotland to collect historical objects for the museums of the Service.

Wildlife

Although further reduction is necessary, the serious overgrazing in Yellowstone was greatly reduced by the elimination, in cooperation with the State of Montana, of 6,535 elk from the northern herd. Also, 73 bison were removed from Yellowstone. In Grand Teton 310 elk were shot by 624 permittees deputized under Public Law 787, and at Wind Cave 85 bison were eliminated under a cooperative agreement with Custer State Park. Small numbers of deer were removed from congested areas in several parks.

Black bears continued to present problems with 73 personal injuries in Yellowstone, 18 in Great Smoky Mountains, and 7 in Yosemite, and there was considerable property damage.

Wolves have increased at Isle Royale and studies are being made to determine the effect of their predation on moose, beaver, and hares. Studies of bats at Carlsbad Caverns were intensified following the discovery of rabies among them in the summer of 1955.

Museum Branch

The Museum Branch enlarged its technical staff within carefull calculated limits to keep pace with expanding needs. Mission 66 wi require the central Museum Laboratory to plan, build and insta museum exhibits at the rate of several hundred units per year. A the same time, museum collections, growing steadily in size ar importance, require more preservative treatment and other specialize care.

Museum Planning

The scheduling of several visitor centers in the 1957 constructio program created an urgent need for detailed exhibit plans. Thr exhibit planning teams were set up to collaborate with park staf By the end of the year exhibit specifications and layouts were co pleted for 7 museums and were well underway for 5 more. In add tion, another kind of exhibit plan, a "furnishing plan" for histor house museums, was adopted. The first of these was prepared for t Andrew Johnson Home.

Exhibit Construction

The Museum Laboratory prepared and installed the exhibits f the visitor center at Petersburg National Military Park, the O Faithful Museum in Yellowstone National Park and the museum Devils Tower National Monument. Exhibits were also completed f 9 other parks and were in progress for 6 more. An exhibit on t work of the Department of the Interior was prepared in collaborati with other bureaus for "The American Dream," a traveling exhibiti to visit about 50 cities. Since the Laboratory could not build ma exhibits urgently needed in the parks, park staffs at Mesa Ver Yosemite, and Southwestern National Monuments produced so displays for their museums to fill the gap.

Museum Accessions

The museum collections of the National Park Service owe much t generous donors. The Thomas A. Edison Foundation present hundreds of items representing the principal exhibits and equipme of the Edison Laboratory in West Orange which was to become t Edison Laboratory National Monument. The artist, Robert F. Wi liams, and his wife gave 30 oil paintings interpreting outstandi scenes in the national parks. Col. John J. Driscoll of Paris donat a collection of agricultural tools similar to those used by the 16 century French colonists who will be commemorated at the Fort Ca line National Memorial. Rare books, weapons and other objects for the Fort Caroline Museum were purchased with funds donated for this purpose. All these and other accessions were accepted only when they filled recognized needs to increase public understanding and enjoyment of the parks. To guide the continued growth of the collections, revised policies and procedures for this and other aspects of museum development and administration were issued.

The exceptionally valuable collection of Americana willed to the National Park Service by the late Lloyd C. Smith of Morristown was transferred to the Service. This collection includes not only manuscript material on George Washington and the Revolution, but much other manuscript material on American Colonial and Revolutionary history. It will be housed in the new library wing of the museum, for which a construction contract has been let.

Preservation of Scientific and Historic Collections

Expert treatment given by preservation specialists of the Museum Branch included one of the most extensive mural restoration projects undertaken with modern methods. The rotunda murals in the Old St. Louis Courthouse, Jefferson National Expansion Memorial, which nclude some 24 individual paintings, were cleaned and restored by a specially trained crew operating on scaffolds high above the floor.

Cooperative Activities

To assist State parks and other public agencies, the Museum Branch gave technical advice and, on a reimbursable basis, planned and prepared exhibits. New exhibits were installed for the St. Augustine Historical Society whose interpretive program is closely coordinated with that of the Castillo de San Marcos National Monument. The econd group of exhibits for the Prehistoric Indian Mound State Park in Louisiana was completed and installed. A few exhibits were built for the Carnifex Ferry State Park, W. Va.

Audiovisual Progress

The Service's new audiovisual program provided additional help o visitors in many areas of the System through the means of audioguiding systems, automatic illustrated programs, and high-fidelity public address and sound devices. Audioguiding systems at Castillo de San Marcos and Fort Pulaski National Monuments were installed on self-guiding tours and proved popular with visitors. Under this program, 11 slide projectors and 7 projectographs synchronized with tape recorders were also developed to give automatic illustrated programs. New sound devices were developed to provide background music of the Civil War at the Manassas Museum. A new device was furnished for the orientation talk at the base of the Washington Monument. In the electronics laboratory an especially notable achievement was the development of a new electronic trigger circuit to synchronize slide projectors and projectographs with tape recorders.

In addition to this progress in reaching the public, the naturalist staff of National Capital Parks prepared a slide talk, Conducted Trips, an effective audiovisual training aid, which is being put to wide use.

Publications

The appropriation for 1956 provided increased funds, for the first time in several years, for the Service's publications program, and thus gave greater recognition to its importance both in management and interpretation.

During the year, the first of the proposed revisions of informational publications dealing with the 28 national parks came off the press. This was the Sequoia-Kings Canyon National Parks booklet, in a new and more effective format, written in a more friendly and less impersonal style. The booklet on Zion National Park, second in the series, went to the printer.

Revised editions of established publications off the press during the year included James Towne in the Words of Contemporaries; two historical handbooks (Saratoga and Petersburg); and two tree preservation bulletins (Ropes, Knots and Climbing; and Shade Tree Pruning). One new historical handbook (Bandelier), the first dealing with an archeological area, was also issued. The Chickamauga and Chattanooga, and George Washington Birthplace handbooks, were sent to the printer, as were seven handbook revisions (Saratoga, Fort Necessity, Hopewell Village, Kings Mountain, Fort Raleigh, Petersburg Battlefields and Custis-Lee Mansion); also a revised tree preservation bulletin Safety for Tree Workers. In anticipation of increasing public interest in literature dealing with Jamestown and Yorktown, because of the anniversary celebration in 1957, the booklet, America's Oldest Legislative Assembly and Its Jamestown Statehouses, also went to the printer in revised form.

Requisitions for printing free informational publications dealing with units of the System totaled 117, and called for the production of 7,624,000 pieces of printed matter. Revised issues of the Eastern and Western United States maps, which have so greatly reduced mailings of other free literature, reflect further economy by providing for mailing without the use of envelopes. The folder, National Parks and National Forests, which has been so useful in clearing up widespread public misunderstanding, was issued in a revised format and text. For the first time, information on Camping Facilities in the National Park System, was issued in printed form.

DESIGN AND CONSTRUCTION

In spite of difficulties encountered in recruiting the adequate professional staff required to implement the expanded 1956 construction programs and to initiate surveys and plans essential to the orderly progression of the more comprehensive construction programs of Mission 66, gratifying progress has been made toward both of these important objectives. Of a total construction program for buildings and utilities, roads and trails, and parkways, amounting to $35,807,359 including carryover balances from the 1955 fiscal year, it has been possible to effectively obligate or commit approximately 90 percent of the available funds. In addition, sufficient progress has been made on plans and surveys for construction projects included in the 1957 fiscal year program to encourage the hope that an appreciable percentage of this work as well as all of the 1955 carryover balance will be either under contract obligation or committed on day labor projects within the first quarter of the fiscal year.

Meeting the Employment Problem

Steps which have been taken to overcome the employment problem include contracting with private engineering and architectural firms for plan preparation and construction supervision, and contracting for surveys and mapping. Increased services have been obtained from the Public Health Service of the Department of Health, Education, and Welfare under memorandum of agreement. In addition to the increase in routine cooperative services needed to facilitate the Mission 66 program, arrangements have been made to assign to the Eastern and Western Design Offices, in lieu of engineering vacancies, approximately 10 reserve officers of the Public Health Service for a period covering the 3 summer months and 5 reserve officers for a 2-year period. The seasonal employees are for the most part college professors while those assigned for the 2-year period are all holders of B. S. degrees or advanced degrees in engineering. In the process of formulation is an agreement with the Forest Service of the Department of Agriculture to obtain necessary radio equipment certification tests and related services through the facilities of their Beltsville, Md., radio laboratory.

Efforts are also being made to influence future programs insofar as possible toward the concentration of construction activities at relatively few areas each fiscal year which will enable us to undertake a greater volume of survey and field supervision work with a smaller field staff.

Roads and Trails

The roads and trails program includes $9,049,700 for construction projects in which the Bureau of Public Roads participates with the National Park Service under the terms of an interbureau agreement.

Twenty-one projects were placed under contract in 16 areas. The total obligations for these contracts, including the contract amount, extra work or change orders, plans, specifications, and supervisions, amount to $7,351,002.

The work being accomplished by the 21 projects includes the construction of 3.058 miles of new road to be completed under the present contract, 21.195 miles of road under varying stages of construction, 11.891 miles of roads in stage construction status to be completed under the present contract, 43.857 miles of roads to be reconstructed, the construction of 7 bridges, and such miscellaneous items as tunnel linings and portals, guardrails, and parking areas.

The Federal Aid Highway Act of 1956 authorizes the expenditure of $16 million for the construction and reconstruction of roads and trails for each of the years 1958 and 1959. An appropriation of funds in these amounts will enable the Service to concentrate contracts for road construction and reconstruction within a park area and to complete that phase of park development in a relatively short time, and will assist the Service to reach the goals described in Mission 66.

Parkways

The Federal Aid Highway Act of 1954, covering the fiscal years 1955, 1956, and 1957, provided a total authorization of $32 million for parkway construction. Of the $11 million programed, $4,307,100 was for the Blue Ridge Parkway in North Carolina and Viriginia; $3,630,200 for the Natchez Trace Parkway in Alabama, Tennessee, and Mississippi; $2,340,600 for the Colonial Parkway in Virginia; $432,100 for the George Washington Memorial Parkway in Maryland and Virginia; $90,000 for the Chesapeake and Ohio Canal in Maryland; and $200,000 for advance planning and surveys. With this type of appropriation, parkway construction during this 3-year period will move ahead at a rate compatible with land acquisition and construction priorities.

Major construction contracts totaling $3,371,000 were completed. These included 11 miles of grading, 4 bridges and grade-separation structures, 26 miles of bituminous paving, tunnel lining, hydraulic fills and other incidental work. The work under contract at the end of the fiscal year called for the expenditure of $12,300,000 and applies to 71 miles of grading, 30 bridges or grade-separation structures, 30 miles of paving, plus slope stabilization, tunnel lining, and other work.

Master Plans

The results of the searching reappraisal of Service objectives and responsibilities accomplished by Mission 66 are being reflected in revised master plans for each park. Although this program has only begun, it will be accelerated in the forthcoming year as final Mission 66 prospectuses are approved. Priorities of master-plan preparation are coordinated with construction programs so that working drawings for projects scheduled early in the Mission 66 program will not be delayed.

Buildings

The construction program for buildings is geared to the theme of public service. Resumption of active work in this field will provide additional interpretive and information facilities in the form of new visitor centers in several parks, enlargement of campgrounds with new comfort stations to serve them, enlarged utility areas to shelter Service equipment, and construction of lodging and related accommodations for visitors in some of the more remote parks. The first substantial work toward alleviating the critical shortage of employee housing was begun; studies of standard house plans were prepared to accelerate selection and construction of dwellings in the parks.

Among the first new visitor centers will be those under construction at Yorktown and Jamestown Island in Colonial National Historical Park, Va.; Grand Canyon National Park, Ariz.; and Carlsbad Caverns National Park, N. Mex. Overnight tourist accommodations in the form of multiple-room lodges are being constructed in Isle Royale National Park. A concessioner's building and concessioner's employee dormitory are under construction in Mount Rushmore National Memorial. This will be augmented by a large amphitheater for use in the interpretive program there.

The Service employee-housing construction begun this year comprises units for both permanent and seasonal occupancy. Priority is being given to those remote areas which are in most urgent need of adequate housing.

Utilities and Miscellaneous Structures

This program included approximately 27 projects aggregating in cost about $600,000. Among these were water, sewer, power and communication systems or extensions and additions thereto. In addition, contracts were awarded for similar projects, funds for which were carried over from the 1955 or previous fiscal years.

Notable among the larger projects placed under contract during the 1956 fiscal year are the following: The sewer and water systems for the Moose Headquarters of Grand Teton National Park, the sewer and water systems for the Canyon Area development at Yellowstone National Park, an addition to the sewage treatment plant and repair of major storm damage to the sewer system at Yosemite National Park, the extension of the water and sewer systems for the Swift Current development at Glacier National Park, completion of the water system for the Basin development at Big Bend National Park and the construction of a sewer system for Yorktown, Va., in Colonial National Historical Park.

Storm Damage

Widespread storms during 1955 in the Pacific coast region resulted in extremely heavy flood damage in nine areas administered by the Service. Repair and replacement of roads, trails, bridges, dykes, and electric systems have cost approximately $1,650,000.

OPERATIONS

The Division of Operations continued to give primary emphasis to assisting field organizations in caring for the park areas and in managing the increasingly large crowds of park visitors. Progress has been made on all phases of operations, conservation, protection, and betterment.

Many annoying problems arising from private ownership of lands which blocked operational efficiency or development have been resolved, although much remains to be accomplished. Concessions operations are in good condition, with most contracts and business concession permits current.

Because of the concern of this division with park operations it has been necessary for a number of employees of the division to spend considerable time on the Mission 66 program. It offers a real opportunity for actual increases in operating funds to fill many of the present most urgent needs. Also, in the Mission 66 study, attention was given to developing new work methods and many promising leads are being explored. The Division of Operations cooperated closely with area management studies which were made on a pilot study basis in each region.

A major task has been the 10-year forward projection of development programs to carry out Mission 66. These will be subject to alteration in future, but the basic job is done and the development and management patterns in each area are clearer now that for many years past.

Park Rangers

The Branch of Conservation and Protection worked particularly toward improvement of park ranger standards in cooperation with the Branch of Personnel. The importance of district rangers as key representatives of the superintendents was emphasized. The branch also reviewed and advised on many reclassification proposals for park rangers and professional employees.

Continuing attention was given to training protection personnel in special phases of their work, such as rock climbing, rescue, law enforcement, and informational services.

Structural Fire Control

A 10-day school, primarily designed to train park men in structural fire inspection, recognition of hazards, and control techniques, was conducted in Yosemite National Park by the California State Department of Education. Thirty-four rangers and others from 25 areas and offices of the Service took the course. Each trainee in turn conducted similar employee training courses in his own area.

Forest Protection

Considerable high fire hazard existed in the Southern States and northern Rocky Mountain areas; the sixth consecutive year of drought continued in the Southwest; and a short period of extremely critical fire danger occurred in California. For 7 tense days, September 3 to 10, 1955, a fire seriously threatened the General Grant Grove in Kings Canyon National Park, but the combined resources and fine cooperative efforts of State, Forest Service, and park protection forces held the fire at the boundary. Forest fire losses were well below the 20-year average. The value of prevention efforts directed at specific causes of fires is reflected in a reduction of smoker fires to 58 percent of the 25-year annual average, despite record visitation to the parks. The Service continued to assist in organizing and training the nearly 1,000 organized Southwestern Indian firefighters, who have proven so effective on large fires.

Forest Pests

Control programs, carried on with technical assistance from entomologists and pathologists of the Department of Agriculture, continued to provide generally good protection from forest insects and diseases. Progress was made toward protection from white pine blister rust in all park areas containing important stands of five-needled or white pines. Intensive research to find a means of controlling lodgepole needleminer, threatening high elevation pines of Yosemite National Park, has produced promising experimental results. If tests are successful, a major control attempt will be made. The threat of the southern pine beetle in Great Smoky Mountains National Park and Blue Ridge Parkway was greatly lessened by control work. In many public-use areas, spraying to control defoliators was continued.

The tree maintenance crew traveled into 39 areas, including 5 national cemeteries. About 3,000 trees were pruned, 380 dead or dangerous trees removed, and a tree feeding and bracing program carried on.

Maintenance

Continuing attention was given to maintenance staffing requirements in field areas in the Regional Offices and additional refinements were made in programing funds on a workload basis. Thus, Mission 66 projections could be based on known workload factors. Subsequent adjustments must be made to reflect increases in building and utilities construction prices due to rising labor and material costs. The Bureau of the Budget has reorganized this problem and provided increases to cover increased cost.

Travel to the Parks

Public use of the areas administered by the National Park Service continued the upward trend which has been constant since 1946. Visits to all areas totaled over 50 million in 1955 as compared to 47,800,000 in 1954, an increase of nearly 5 percent. Thirteen areas had more than 1 million visitors each, three of these had more than 2 million each.

Travel Survey

Further progress was made on the program of travel surveys for national parks. These surveys are made to obtain information on use of visitor facilities and on travel habits and expenditures, and are conducted in cooperation with the Bureau of Public Roads and State highway departments. This year the Grand Canyon National Park survey report was published by the Arizona Highway Department. Field work began on a second survey of Great Smoky Mountains National Park.

Programing for Mission 66

Preparations were made for expeditious and efficient processing of the increased park development programs under Mission 66, beginning with those for the 1957 fiscal year. This 10-year forward projection has been completed. It provides a sound basis for analysis of future protection, conservation, use, and development needs, and for budget preparation and justification.

Streamlined Development Program Preparation

Steps were taken to decentralize many programing details to Regional Offices. At the same time much paperwork has been eliminated through lessened requirements for advance project-construction-proposal forms for individual projects.

Reporting Procedures on Construction Progress Improved

Improved reporting procedures have been developed whereby the eastern and western Offices of the Division of Design and Construction will report on the status of approximately 800 projects each month. This report form was developed cooperatively by the Division of Design and Construction, and the Branches of Finance and of Programs and Plans Control. It will serve as an essential management document and for many other purposes, including compliance with report requirements of the Bureau of the Budget and Congress.

Advance Program Approval by Congress

Approval of construction programs is being sought 2 or 3 years in advance, rather than for the one fiscal year as in the past, though of course subject to the usual budgetary limitations on appropriations for particular years. Because of increased flexibility, such advance approval would greatly facilitate both obligation of funds and work accomplishment.

Land Acquisition

During the fiscal year $1,250,000 was made available for land acquisition. As in 1955, $500,000 of this amount was received from

Jackson Hole Preserve, Inc., to match $500,000 of appropriated funds conditioned on matching donations. Some 46,000 acres of inholdings were acquired by purchase, donation, or exchange.

Donations included some 4,100 acres from the State of North Carolina and 270 acres from the Commonwealth of Virginia for Blue Ridge Parkway; 2,800 acres from the State of Mississippi for Natchez Trace Parkway; 10,680 acres from the Commonwealth of Kentucky, 2,030 acres from the State of Tennessee, and 7,480 acres from the Commonwealth of Virginia for Cumberland Gap National Historical Park; 720 acres from the Union Land and Grazing Co. for Fort Union National Monument, N. Mex.; and about two acres and improvements thereon from Thomas A. Edison, Inc., for the proposed Edison Laboratory National Monument, N. J.

Completed purchases and approved options cover some 17,500 acres of land and improvements in Big Bend, Glacier, Grand Canyon, Grand Teton, Great Smoky Mountains, Lassen Volcanic, Rocky Mountain, and Yosemite National Parks; Colonial and Saratoga National Historical Parks; Fredericksburg and Gettysburg National Military Parks; Manassas National Battlefield Park; Theodore Roosevelt National Memorial Park; and Death Valley, Devils Tower, and Joshua Tree National Monuments. Options totaling about $300,000 awaited approval at the end of the year.

About 25,000 of the 28,500 acres within the Cape Hatteras Seashore project have been acquired. However, in one condemnation case, involving about 2,000 acres, the commissioners appointed by the United States District Court recommended an award of $484,000. On the basis of appraisals obtained prior to instituting condemnation proceedings, $185,000 had been paid into the registry of the court as estimated just compensation. If the Government is unsuccessful in obtaining a lower award, additional funds must be found to complete the Cape Hatteras land acquisition. The State of Maryland continues efforts to acquire 800 acres of land for Harpers Ferry National Monument project. Acquisition of the extension to Wright Brothers National Memorial, with funds previously donated, continues. Some $7,300,000 of the $7,700,000 appropriated for acquiring the properties at Independence National Historical Park have been obligated; land acquisition there is virtually completed.

Special Uses of Park Lands

The majority of special use permits issued during the past year continued to be for agricultural use of small parcels of land to maintain historical and rural scenes, for access facilities from private lands to park roads, and for utility lines.

The Atomic Energy Commission in most cases has completed its reconnaissance surveys for strategic minerals in areas of the System. The number of requests for information on prospecting and mining in national parks and monuments decreased during the past year.

Water Rights

Progress in the establishment and preservation of rights to the use of water in Service areas continued with the preparation of 37 Federal claims. Of these, 7 claims are applications for appropriation of water to comply with water laws of various Western States; 11 support a Federal protest of conflicting private appropriations of waters of the Tuolumne River below Yosemite National Park, Calif.; and 18 define Federal interests in waters of the Lower Colorado River as part of Federal intervention in the case of *Arizona* v. *California* before the Supreme Court. Proofs for final licensing of 10 rights under 5 previously established permits were filed in Nevada and Utah.

Concession Authorizations

Fourteen concession contracts and 29 concession permits were negotiated during the fiscal year.

The new contract with the Yellowstone Park Co. calls for a construction program in Yellowstone in the amount of $3,500,000 during the first 5 years. This will be expended on construction in the new Canyon Village for which ground-breaking ceremonies were held on June 25.

Additional improvements are estimated to cost $10 million during the next 5 years of the contract. The Hamilton Stores, Inc., contract also provides for construction of facilities in the new Canyon Village and other locations. In Yosemite National Park, Degnan, Donohoe, Inc., is planning new construction in the New Village area. Several smaller concessioners have included improvement programs in connection with the issuance of new authorizations.

Prospectuses

Eight prospectuses were issued soliciting offers for operation of certain concessions at Mount McKinley, Glacier, and Olympic National Parks, Cape Hatteras National Seashore, Coulee Dam National Recreation Area, and Channel Islands National Monument. As a result, concessioners were found for Glacier, Cape Hatteras and Olympic.

Concessioner Improvements

At Yosemite, the Yosemite Park and Curry Co. has completed a new development at Yosemite Lodge which includes lounge, lodging, and dining facilities costing nearly $1 million. At Grand Canyon National Park, Fred Harvey has expended some $694,000 for capital improvements on the South Rim and is planning a motel of 100 to 150 rooms at an estimated cost of $500,000. A new concessioner employee dormitory building, costing more than $200,000, was completed at Mount Rushmore National Memorial; this will be followed by construction of a new building to house concession operations. At Shenandoah National Park the Virginia Sky-Line Co. constructed a new general service building and two new cottages at Skyland. A marine service building at Flamingo Key in Everglades National Park is 90 percent complete. The Glacier Park Co. completed an employee dormitory, three 14-unit motels, and an extension to the Many Glacier Coffee Shop. Improvements were also made to the Many Glacier Hotel. Concessioners at many other areas completed minor improvement and building programs during the year.

The new Jackson Lake Lodge in Grand Teton National Park operated at capacity during the 1955 season. The Grand Teton Lodge Co. is now constructing a cabin development at Colter Bay which will be completed for the 1957 season.

RECREATION RESOURCE PLANNING

Progress was made in the Service's planning and cooperative assistance programs relating to park and recreation resources. These responsibilities, formerly called Cooperative Activities, were placed under the more descriptive and appropriate organizational title, Recreation Resource Planning.

New Areas Established

Cumberland Gap National Historical Park in Kentucky, Tennessee, and Virginia, authorized in 1940, was formally established; it contains more than 20,000 acres. Fort Union National Monument in New Mexico was established with approximately 720 acres, purchased by private subscription and donated to the Federal Government. Donated lands, buildings and exhibits were accepted to comprise the Edison Laboratory National Monument, N. J. (established July 14, 1956). Nearby "Glenmont," Thomas A. Edison's home, was established as a national historic site in non-Federal ownership.

New Areas Authorized

Acts of Congress authorized establishment of the City of Refuge National Historical Park in Hawaii and an area in Virginia to be known as the Booker T. Washington National Monument. An agreement between the city of Bayard, Nebr., the Nebraska State Historical Society, and the Secretary of the Interior paved the way for the establishment of Chimney Rock as a national historic site in non-Federal ownership. Pending as the year closed and subsequently enacted were bills authorizing establishment of Pea Ridge Battlefield National Military Park, Ark., Horse Shoe Bend National Military Park, Ala., and the Virgin Islands National Park. Laurance S. Rockefeller has purchased more than 5,000 acres within the latter park for donation to the Federal Government.

Area Abolishments

Legislation was enacted to abolish Old Kasaan National Monument in Alaska, Castle Pinckney National Monument in North Dakota, and Fossil Cycad National Monument in South Dakota, pending at the end of the year, were later passed and signed by the President.

Boundary Adjustments

Legislation was enacted to authorize the addition of 250 acres to Pipestone National Monument in Minnesota and the exchange of properties at Colonial National Historical Park in Virginia to consolidate Federal ownership there. Legislation was also approved to exclude about 800 acres in the North Unit of Theodore Roosevelt National Memorial Park in North Dakota, to add 60 acres at Medora in the South Unit, and to add about 155 acres to Devils Tower National Monument in Wyoming. Presidential proclamations corrected the description of Hovenweep National Monument in Utah and Colorado and added an important ruin thereto; added 960 acres and excluded 8,266 acres at Great Sand Dunes National Monument in Colorado; and added 320 acres to Rocky Mountain National Park in Colorado. Legislation approved in July added Zion National Monument to Zion National Park.

Bills were introduced, but not passed, to revise the boundaries of Lassen Volcanic National Park; to authorize additional acreage for Whitman National Monument, Wash.; to establish a Dinosaur National Park; to revise the boundaries of Sequoia and Kings Canyon National Parks, Calif.; and to extend the boundaries of Oregon Caves National Monument.

Special Studies

A contract was entered into with the Fort Hays Kansas State College to make a study to determine the location and extent of any remaining typical segments of original Great Plains grasslands.

Threats to the National Park System

The Corps of Engineers proposed the Smoky Range Dam in lieu of the Glacier View Dam on the north fork of the Flathead River. This proposal, opposed by the Department, would flood approximately 8,700 acres of Glacier National Park. There have been recurrent proposals to open Joshua Tree National Monument to prospecting and mining.

The continued and forceful opposition of conservation organizations throughout the country to the proposal to authorize construction of a dam at Echo Park, in Dinosaur National Monument, resulted not only in its omission from the legislation which finally authorized the Upper Colorado River project; the legislation specifically prohibited construction of any dams in any national parks or monuments in the upper basin.

Park Practice Program

Pursuant to recommendations made at the Public Services Conference held in Gatlinburg, Tenn., and Fontana Village, N. C., last September, the Service joined with the National Conference on State Parks to afford an effective means of exchanging ideas and experiences on park practices and solutions of park problems of all kinds. A Park Practice Section was established to handle the Service's participation in this joint undertaking.

Advisory and Consultative Assistance

The Service assisted 49 of the States and Territories on 354 occasions on a wide variety of park and recreation problems. Some of the more significant examples are: (1) Assisting the Arizona Development Board in making its survey and report on the need for establishing a State park system, (2) cooperating with the Maine State Park Commission in bringing up to date their statewide park and recreation plan, (3) consulting with the newly created Breaks Interstate Park Commission concerning planning, development, and operation of the highly scenic 946-acre Breaks Interstate Park in Kentucky and Virginia, (4) assisting in the study of forest management practices in Itasca State Park in Minnesota and preparation of the comprehensive covering report, and (5) assisting the Texas State Parks Board in evaluating proposed park areas at Monohans Sands, Enchanted Rock, and a site on the Stamford Reservoir.

Assistance also was furnished to other Federal agencies such as the Bureau of Land Management, Bureau of Indian Affairs, and the Forest Service. Of particular significance is the development of a cooperative agreement under which the Service will prepare plans for the protection and development of the Dead Horse Point-Junction Butte Recreation Area, an area of outstanding scenic and scientific interest in southern Utah, administered by the Bureau of Land Management.

Real Property and Disposal

During the year, the Service investigated and reported upon 31 applications submitted by State and local agencies to the General Services Administration and other disposal agencies to acquire Federal surplus properties for park, recreation, and historical monument use; and upon 21 applications received by the Bureau of Land Management to acquire public domain lands for similar purposes. The work of determining and enforcing compliance with terms and conditions of the deeds transferring surplus properties now equals or exceeds that of initial investigations and will continue to increase.

State Park Statistics

The Service publication issued under this title for 1955 reveals 2,034 State parks and related recreation areas containing more than 5 million acres; expenditures of $21 million for capital improvements and $34 million for operation and maintenance; attendance exceeding 193 million; 5,657 year-round and 7,980 seasonal employees. Tent and trailer camping increased more than 19 percent over 1954.

Regional and Basinwide Surveys

A brochure, Our Vanishing Shoreline, summarized the results of an 18-month survey to determine the remaining opportunities to preserve outstanding natural seashore areas along the Atlantic and gulf coasts. Funds were donated to the Service for both survey and brochure. Of 126 undeveloped areas studied, 54 were recommended for some form of public ownership. Special reports were prepared on 16 of the most significant areas. At least two, the Great Beach area, on Cape Cod, and Cumberland Island, Ga., were considered of national significance.

The Recreation Subcommittee of the Columbia Basin Interagency Committee was organized and has been engaged in a basinwide analysis of recreation. It has participated also in the reappraisal of the water-control possibilities of the Rogue River Basin. The development of long-range plans in the Missouri River Basin Recreation Survey was continued. Work was begun on a study of the recreation resources of Delaware River Basin.

Special Recreation Surveys

In the California Central Valley, activities in the Upper American River Basin included the preparation of a reconnaissance report on the recreation potentials of the basin and cooperation with other interested agencies to protest plans which would have resulted in the invasion of the Desolation Valley Wilderness and the inundation of Gold Discovery Site State Park.

Substantial progress was made on the recreation-resources portion of the Department's study of the natural resources of the six major coastal drainage basins of northwest California.

With the establishment of a field office in Yuma, Ariz., preparation of a recreation master plan for the Lower Colorado River was begun.

In cooperation with the State of Missouri a plan was prepared for the conservation and development of the recreation resources of the Current and Eleven Point River Basins, which were determined to be of such significance as to merit cooperative action by Federal, State, and local government agencies.

Reservoir Development

Cooperative studies of individual water-control proposals and projects included the appraisal of 11 sites for the Bureau of Reclamation, 1 area for the Fish and Wildlife Service, and 1 Corps of Engineers project. Review of applications for Federal Power Commission permits dealt with 25 proposals.

Four agreements were negotiated: State, county, and municipal agencies, for the administration of reservoirs constructed by the Bureau of Reclamation. The California Legislature voted in favor of transfer of the Millerton Lake National Recreation Area to the State for administration by the State Division of Beaches and Parks.

Nationwide Recreation Plan

Work was initiated on the National Recreation Plan, one of the important phases of the Mission 66 program. The nationwide study, to be completed in 1961, will focus attention on the growing need for outdoor recreation facilities and the role of the various levels of government in meeting this need.

ADMINISTRATION

Budget and Finance

Appropriations.—The cash appropriations to the Service for the 1956 fiscal year were substantially greater than those for the 1955 fiscal year. A large portion of the total increase was represented by a larger amount of cash appropriated to liquidate roads and trails and parkways contract authorization than was provided in 1955 and by additional amounts provided in supplemental appropriations to meet increased salary costs. While the Service's obligational authority for 1956 was greater than that for 1955, such increases were not as great as those reflected in the cash appropriations. The comparative amounts are as follows:

Appropriation item	1955 fiscal year	1956 fiscal year	Increase or decrease
Management and protection	[1] $9,227,730	$10,443,000	$1,215,270
Maintenance and rehabilitation	[1] 8,441,968	9,094,000	652,032
General administrative expenses	[1] 1,100,000	1,250,000	150,000
Construction	4,118,200	8,425,000	4,306,800
Construction (liquidation of contract authority)	9,500,000	19,654,300	10,154,300
Total cash appropriations	32,387,898	48,866,300	16,478,402
Construction (unfunded contract authorization for roads, trails, and parkways)	10,500,000	3,845,700	−6,654,300
Total obligational authority	42,887,898	52,712,000	9,824,102

[1] These figures include amounts transferred from other departmental appropriations to cover increased pay costs.

New accounting system.—The new accounting system, which has been in the process of development as a cooperative undertaking of he General Accounting Office, the Department's Division of Budget and Finance, and the Service's Branch of Finance for the past 2 years, was installed in 15 of the 28 Field Finance Offices, including the five regional offices, during the 1956 fiscal year. It will be installed in all of the Finance Offices by December 31, 1956.

Changes in budgetary procedures.—In accordance with the recommendation made in 1953 by the Department's Organization and Management Survey Team, and in 1954 by the Accounting Survey Team, new budgetary procedures put into effect during the 1956 fiscal year require the consolidation of the field estimates by the regional offices into regional budget submissions.

Inventory control and equipment management.—During the 1956 iscal year, a new heavy equipment inventory control system was esablished and basic principles and standards for equipment management were prescribed. Incident to putting the inventory control ystem into effect, equipment surveys were conducted throughout he Service on a regional basis to determine whether the Service has xcess equipment items and what additional items are needed, and to recommend equipment inventory levels at the various field areas. The survey was completed in May 1956. The new system of inventory control and the new precedural requirements are expected to result in much better utilization of equipment and in improvement in equipment management.

Personnel Management

Personnel actions.—The year brought a heavy volume of personnel actions, continuing the pattern established in the preceding year by the large number of transfers, promotions, and reassignments resulting from reorganization and from the staffing of the new Region Five Office. The most important action was that of establishing and filling the position of Associate Director early in the second half of the fiscal year. The appointment of Eivind T. Scoyen, a career employee, to this position resulted in shifts in several high level positions in the Service. Scoyen was promoted from Superintendent, Sequoia and Kings Canyon National Parks.

Assistant Director Thomas J. Allen succeeded Mr. Scoyen at Sequoia and Kings Canyon; Chief of Lands Jackson E. Price became assistant director; and Chief of Concessions Management Donald E. Lee became chief of lands. Region One Chief of Operations, A. Clark Stratton, was appointed chief of concessions management.

Decentralization of authority.—The trend toward decentralization of authority to field officials was continued. The most important single development was the establishment of 7 new personnel officer position, 1 in each of the 5 regional offices and 1 each in the Eastern Office and Western Office, Division of Design and Construction. With the addition of these positions, the level of appointing authority delegated to Regional Directors and to the chiefs of the two Design and Construction Offices was increased from grade GS–9 to grade GS–11, and a similar increase was made in the appointing authority of superintendents in grade GS–13 and higher. The addition of the Regional Personnel Officer positions was also responsible, in part, for a decision that, for the first time, limited position classification authority (through GS–7) could be delegated to the Regional Directors.

Staff operations.—The reduction in the volume of individual cases, which resulted from the broadened delegation of authority to field officials, enabled the personnel staff to devote more time to staff operations, such as the preparation of manual material and standards. For the first time, a Personnel Management section appears in the Administrative Manual of the Service, and chapters on position classification, training, leave, and retirement have been completed. Revision of the class specifications for the park ranger series adopted in 1948 was completed and is now in the hands of the Civil Service Commission.

Training.—Continued strong emphasis was placed on training and employee development. To get the decentralized classification authority off to a good start, the new Regional Personnel Officers were put through an intensive 6-week position-classification training course in the Washington Office.

The 15th general administration training course was conducted in the Region Four Office for the benefit of 24 employees, bringing to 365 the number of men who have completed the course since 1941.

A pilot course in instructor training, with splendid assistance from the California State Board of Education, was undertaken very successfully by the Region Four Office at Sequoia National Park, Calif., in April, for the benefit of selected supervisors and instructors from Region Four field areas.

The year also saw the completion of a very important training aid, The National Park Service Manual of Training Methods, a publication designed to acquaint supervisors with the more important methods and principles of individual and group instruction.

Safety

Visitor-accident fatalities.—Visitor-accident fatalities for the calendar year 1955 followed the pattern of previous years, namely, about one visitor-accident fatality per million visitors. For 1955, the rate was 1.08 per million visitors. Motor vehicle accidents and drownings continued to be the leading causes. The increasing popularity of small motorboats suggests the needs for a more active program of water safety in locations such as Lake Mead National Recreation Area.

Training of personnel.—At the request of the Regional Director, Region Three, Santa Fe, N. Mex., a course in the installation, operation, maintenance, and inspection of liquefied petroleum gas systems was given at Big Bend National Park to selected Region Three personnel.

Employee safety.—The Service is cooperating fully with the Department in its employee safety program. The helpful interest of the Department in employee safety has stimulated increased Service activity in this field.

Current problems.—The Service is aware of its responsibility for the safety of visitors and employees. An expansion of the safety staff will be made as soon as practicable in order to meet such responsibilities more adequately and to prepare safe practice standards, keep them up to date, and handle all such matters more expeditiously.

DIVISION OF AUDITS

The internal audit program carried out by the Division of Audits is intended to provide management with an objective appraisal of operations and to provide a systematic and recurring review of all phases of financial management. As a result of this program many recommendations have been made which have been of significant value to management. Effective procedures have been established for issuing reports on audit and other examinations, and for determining whether appropriate action is taken. Major reports completed during the year included those on the audit of the United States Park Police; the Organizational Structure of National Capital Parks; McKinley Park Services, Inc., Mount McKinley National Park, Alaska; and the operations at Yellowstone National Park, Wyo.

The difficulty of recruiting auditors qualified to participate in this broad internal audit program at the grade levels authorized continued to be a major problem.

The claim of $25,074.15 against the Sutton Line, Inc., resulting from a prior year audit was settled by the Department of Justice. The claim against B. B. Wills in the amount of $54,765.71 is still pending.

NATIONAL CAPITAL PARKS

Physical Improvements

Significant physical improvements in the parks of the National Capital included the Columbia Island parking lot at the motorboat marina; a new dining hall at Catoctin Mountain Park; Roosevelt Island comfort station; Annapolis interchange and completion of landscaping of all other interchanges on the Baltimore-Washington Parkway; and the reconstruction of East Beach Drive from Broad Branch to Military Road in Rock Creek Park.

Special Events

Some 290 special events were held in the parks, including such major undertakings as the Christmas Pageant of Peace, the Independence Day Celebration, and the President's Cup Regatta.

Visitor Services

Historical and natural history programs were carried on, including school assembly talks, junior naturalist training course, and organized museum visits. A 3-minute recording for visitors was introduced at the Washington Monument. An extensive collection of photographs and other relics were donated to the Lincoln Museum.

Research and Planning

The study to determine the most appropriate treatment for the preservation of Ford's Theater progressed with the completion of the reports on the historical and architectural features and the structural analysis. A historical study on the Old Stone House and a research paper establishing the site of "Suter's Tavern" were completed.

Investigations were made to improve the floodlighting at the Thomas Jefferson Memorial and the Washington Monument and for new electrical services at the Washington Monument. Construction plans were completed for the Virginia section of the George Washington Memorial Parkway from Spout Run to Glebe Road.

Scientific research projects in agronomy, plant pathology, and horticulture, in the control of crabgrass and Dutch Elm disease, were conducted.

Protection

The United States Park Police were commended by President Dwight D. Eisenhower for their services during the 51-day Capital Transit strike.

Land Acquisition

Some 37 land parcels were acquired, including the Smoot Sand Gravel Co. tract which permits construction of the George Washington Memorial Parkway from the Lorcum Lane connection to Chain Bridge in Virginia.

OFFICE OF TERRITORIES

Anthony T. Lausi, *Director*

THE primary function of the Office of Territories is to coordinate rather than to control the relationships between the Federal Government and its territorial areas. It was established, not to govern, but to promote the growth of self-government. This does not preclude the exercise by the Office of direct governmental responsibilities in areas where political and economic realities require it. But in such areas the ultimate goal is the transfer to territorial people of all the obligations of democracy which they can reasonably be expected to assume.

This kind of policy is the antithesis of colonialism. It means that one measure of the success of the Office of Territories is the extent to which it can divest itself of political and economic responsibilities.

A major accomplishment along this line occurred in fiscal year 1956. In Alaska the mental health program will at long last become a territorial responsibility as a result of the enactment by the Congress and approval by the President of the Alaska Mental Health Enabling Act of 1956. The Office of Territories, through a private hospital in Portland, Oreg., has administered Alaska's mental health program for many years. Nevertheless, the Office, in cooperation with the Department of Health, Education, and Welfare, played a major role in recommending and securing the legislation which will eventually transfer this obligation to Alaskans.

As a result of the passage of the Federal Aid Highway Act of 1956, Alaska's road program, long operated by the Office of Territories, is being transferred to the Bureau of Public Roads in the Department of Commerce. Henceforth, the Territory of Alaska, with respect to highway developments, will be treated far more as though it were a State than has been true in the past.

The Alaska Road Commission was created 51 years ago to build and maintain Alaska's highway system and has been operated by the Department of the Interior since 1932. Road construction in the Territory was greatly stimulated by the program of military construction which followed Word War II. Appropriations to the Commission which had averaged $1,600,000 per year from 1932 through 1947 jumped to over $20 million per year during the following 8 years.

As a result the period of Interior responsibility for building and maintaining Alaska's highways has seen old roads reconstructed and new roads built connecting all the major cities in western Alaska with high standard roads, almost all of which have been hard surfaced. Many secondary and farm roads have also been built and, equally important, all of the primary system and much of the secondary system is now kept open to traffic winter and summer alike.

The needs of the future will require large additions to Alaska's highway system. In the meantime the Department is transferring its responsibilities to the Bureau of Public Roads in the sure knowledge that the highway construction and maintenance program under the Department's supervision has made a great contribution to the economic and social life of Alaska and to the defense of the United States.

The Department continues to operate The Alaska Railroad but is proposing legislation which will make it a government corporation. The Railroad closed the fiscal year with a net surplus of more than $2 million, while at the same time track, roadway, and equipment were greatly improved, new transportation services were inaugurated, and many freight rates reduced.

In the Trust Territory and in American Samoa the responsibilities of the Department of the Interior, through the Office of Territories, are both more direct and more comprehensive than in most other territorial areas. In these Pacific islands the fiscal year has brought important advances in local government, public health, and education.

In the Trust Territory another islander has become a top district official. While the process is necessarily a slow one, a major administrative goal in the Department is the appointment of Micronesians to government positions, including official positions as rapidly as they can be trained to take over such responsibilities.

An historic development in local government occurred in Ponape when the village of Kolonia became the first chartered town in all of Micronesia. In the field of public health the use of new drugs has come close to eliminating from trust territory islands the dread scourge of leprosy.

In American Samoa important progress has been made in an area where meager resources have meant straitened economic circumstances for many Samoans. While improvements in agriculture have been made, the most significant change has been a tripling of exports through the operation by private enterprise, with government encouragement, of a large fish cannery.

The first commercial air service to these islands began operations during the year and plans for a large airport were progressed which will make American Samoa an essential stop on major Pacific air routes.

Passage of the "omnibus bill" for Guam made a number of Federal laws applicable to the island. This means that Guam can now be included in various programs of the Federal Government relating to health, education, and welfare.

ALASKA

Territorial Prosperity Continues

The high level of economic activity in Alaska continues to confound the prophets who have expected a decline based on decreases in governmental expenditures, particularly in defense construction. It is true that the decline in Government spending has been much less than anticipated. It is also true that private enterprise activity has shown healthy growth.

In western Alaska the success of The Alaska Railroad in achieving a $2 million surplus while reducing freight rates in the face of declining gross revenues is of some signficance. The Railroad lost business to the military Haines-Fairbanks pipeline, but increased its commercial traffic and made substantial economies in operating expenses.

The influence of Federal expenditures will, of course, be very great in the Territory for years to come. But maintenance activities increase as construction declines, while private business, generated in the first instance by military expenditures, goes on to serve both civilian and military needs.

In southeastern Alaska the utilization of the vast coastal forests is destined to be far more important to Alaskan prosperity than government expenditures in that area. Pulp manufacture which began at Ketchikan is extending north and there is growing interest in the possibilities of both pulp and lumber throughout the Panhandle. During the fiscal year preliminary timber sales were made covering approximately 12.75 billion board-feet, looking toward the construction of pulp and lumber mills at Juneau and Sitka.

In western Alaska, interest in oil and gas development continues unabated. While no strikes have been made, drilling has continued, and additional areas of petroleum exploration are being sought.

Legislative and Political Developments

The Department of the Interior recommended to the 84th Congress the enactment of several items of legislation designed to encourage the further economic development of Alaska and to permit the Territory to provide the services required of it by its citizens. Among those enacted were laws authorizing Alaska to incur bonded indebtedness; releasing funds held in escrow under the Tongass Timber Act for road and school purposes; authorizing the Secretary to dispose of lands now included within highway, pipeline and telephone line withdrawals; and creating an International Rail and Highway Commission to study new overland transportation routes between Alaska and the United States.

The 1955 Alaskan Legislature authorized the election of delegates to a convention convened for the purpose of drafting a constitution for a future State government. The convention which met at the University of Alaska concluded its deliberations on February 5, 1956, with the signing of the draft constitution by the delegates. The document was presented to the electorate of Alaska on April 24, when it was ratified by a majority of the voters. In accordance with the terms of ratification of the constitution, a copy has been transmitted to the President for submission to the Congress.

Alaska to Assume Responsibility for Mental Health Program

One of the outstanding items of legislation enacted by the 84th Congress with respect to the Territories was the Alaska Mental Health Enabling Act, approved by the President on July 28, 1956. The act becomes effective 210 days after its approval date.

This legislation, Public Law 830, vests in the Territory of Alaska authority comparable in scope to that of the States and other Territories in the field of mental health and authorizes the Territorial Legislature to enact such laws on the subject of mental health as it deems appropriate. Public Law 830 also provides a financial grant over a 10-year period of $6 million to assist in the development of a comprehensive mental health program; a grant of $6,500,000 to construct hospital facilities in Alaska, and a grant of 1 million acres, including mineral deposits, of vacant, unappropriated, and unreserved public lands in Alaska. Income and proceeds from such lands are to be administered as a public trust and must first be applied to meet expenses of the mental health program.

Commitment procedures for the Alaskan mentally ill were enacted by the Congress in 1900 and have been virtually unchanged since that date. For the past 50 years the Department of the Interior has provided the care and treatment for these persons through a contract with a private institution at Portland, Oreg., with 365 patients under care on June 30, 1956.

The Department of the Interior on May 17, 1955, submitted to the 84th Congress legislation to modernize antiquated commitment procedures and transfer responsibility for mental health to the Territory including various grants substantially the same as those finally adopted by the Congress. The commitment procedures were approved by the American Medical Association, the American Psychiatric Association, and the National Association for Mental Health.

Widespread public misunderstanding concerning the commitment procedures led the Senate to delete them from the bill and to adopt a provision giving the Territory full authority to establish such procedures. In adopting this course of action the Senate Committee on Interior and Insular Affairs stated that it "wishes to go on record as stating emphatically that its action is in no way a repudiation or disapproval of the provisions approved by the House of Representatives and endorsed by such a large number of qualified experts."

The Alaska Railroad Earns Surplus of $2 Million

Despite almost a million-dollar decline in revenues, The Alaska Railroad developed new freight and passenger traffic during fiscal year 1956. Services were improved and new equipment was purchased. No congressional appropriations were requested and net income was again over $2 million.

Overnight passenger service between Anchorage and Fairbanks started during the winter, when two renovated sleeping cars were acquired from the Pullman Co. The new train, "The Midnight Sun," was well received by the traveling public and a third sleeping car was added in the spring. The daylight passenger train, the "AuRoRa," was suspended until summer.

Shippers received benefit of lower rates, under Tariff 5–M, on through cargoes between Pacific coast ports and the Railbelt. This was achieved mainly by increasing the minimum weights for carload freight.

Diversion of traffic to the Haines-Fairbanks military pipeline reduced the movement of bulk petroleum products. Revenue losses were offset by the introduction of unit rail box and trailer-on-flat-car (piggy back) services, which brought new traffic to The Railroad.

Nine unit rail boxes equipped with Thermo King temperature control units were purchased for experimental use. The 24-foot vans are loaded with perishables in Seattle and transported by steamer, flatcar, and truck to the consignee in Anchorage. With their practicability proved, 65 more units were on order—40 nonrefrigerated and 25 with temperature control devices.

Physical improvements started during the year included reconstruction of the Seward dock, with two berths and adequate transit sheds planned. Sixty miles of the Seward-Portage section were ballasted with crushed gravel and three steel bridges in the Matanuska Valley were completed. Over 300 telegraph poles were replaced. New train radios were installed and six locomotives were equipped with dynamic braking devices.

Management improvement programs included further refinement of the new accounting system and the reclassification and rewarehousing of railroad stores. Inventory was reduced substantially. A departmental reorganization was effected to more clearly define staff and line authority. Wage increases made during the year added $280,000 to annual employee payroll.

Summary of The Alaska Railroad income and expenses

	1955	1956
Operating revenues	$17, 719, 769. 04	$16, 750, 984. 84
Operating expenses	13, 576, 031. 52	13, 956, 082. 17
Net operating income	4, 143, 737. 52	2, 794, 902. 67
Other income (net)	−1, 526, 458. 80	−717, 646. 92
Net income	2, 617, 278. 72	2, 077, 255. 75
Operating ratio ... percent	85. 80	88. 40

Important to the Railroad and to territorial transportation are the plans of the Alaska Steamship Co. to construct two 18-knot trainships for service between Seattle, Wash., and Whittier, Alaska. Each vessel is designed to carry 110 rail cars and forty 40-foot trailer vans with service every 4 days. Bids for construction of the vessels were scheduled for opening in September 1956.

Alaska Road Commission

The Alaska Road Commission, created by act of Congress in 1905 as an agency of the War Department and transferred to the Department of the Interior in 1932, has administered the major portion of the Territory's highway development program. The highway system under the jurisdiction of the Commission on June 30, 1956, totaled more than 3,500 miles.

The present highway system consists of a net of all-weather routes connecting the ice-free ports of Valdez, Seward and Haines with interior Alaska's principal cities and military installations, and with the continental United States via the Alaska Highway through Canada. A secondary system connects farming, mining, and industrial areas to the primary network. In addition to the connected network, the system includes 570 miles of isolated roads connecting inhabited areas with air, rail, or water transportation facilities.

During the 1956 fiscal year, 48 projects valued at $23,577,413 were under contract, 27 of which, valued at $17,160,493, were carryover projects from prior years, and 21, valued at $6,416,920, were awarded during the year. Twenty-five projects, valued at $10,055,789, were completed during the year, leaving a balance of 23 active projects valued at $13,521,624 on June 30, 1956.

Winter maintenance mileage has increased steadily in the past several years, until the entire primary system and approximately 1,000 miles of the feeder system are maintained open the year-round. The fact that winter maintenance has been provided over increased mileages without a substantial increase in appropriation reflects the increased efficiency of the Commission's maintenance operation. The Congress appropriated $3,500,000 for operation and maintenance purposes for fiscal year 1956.

The Federal Aid Highway Act of 1956, Public Law 627, approved June 29, 1956, extended the benefits of the Federal aid highway program to the Territory for the first time. The Act also provided for the transfer of the Alaska Road Commission to the Department of Commerce within 90 days of approval of the legislation. At the end of the fiscal year negotiations were underway between representatives of the Departments of Commerce and Interior looking toward the transfer, tentatively set for September 16, 1956.

Alaska Public Works Program

In 1949, by Public Law 264, the 81st Congress authorized a $70 million program of public works in Alaska to foster economic and social development through provision of facilities for community life. This 5-year act was later extended by Congress to June 30, 1959. Under this program the Federal Government, upon application by a public body, such as the Territory, a city, a school or utility district, finances the entire cost of construction of approved projects and, upon their completion, transfers them to the public bodies for whom they are built at prices that will return to the Treasury of the United States not less than 50 percent of the total cost.

Through the fiscal year 1956 the Congress appropriated $53,708,200 with which 126 projects have been financed, including 49 schools, 6 hospitals, 8 other municipal buildings, 34 sewer and water projects and 29 other projects, including streets and utilities. Of these, 75 projects, costing approximately $29,371,000 have been transferred to applicants, and 15 others, costing in the neighborhood of $4,677,000 are in process of transfer. There are 24 projects, estimated to cost $15,836,000, under construction. Of the remaining 12, estimated to cost $3,741,000, some will be under construction this summer and the others will be started at the beginning of the 1957 season.

This has been a popular program in Alaska and Alaskan citizens have been more than willing to authorize the necessary taxes to repay their share of its cost. While there remains to be appropriated only $11,324,000 of the originally authorized $70 million, there are pending at the present time applications for projects estimated to cost $40,860,000.

HAWAII

Conditions in Hawaii during the year were excellent in almost all respects. The economy of the Territory continued its rising trend and the increased collections of the general excise tax indicated that the volume of business on which the tax is based was larger than ever before. Tourism continues to hold out the best promise of immediate gains in the wealth of Hawaii. During the last 6 months of the year tourists arriving in the islands exceeded the number arriving in the same period the previous year by 25 percent.

During the year a 3-year labor agreement in the pineapple industry and a 5-year agreement in the sugar and stevedoring industries were negotiated. These agreements should insure a more favorable outlook in the three industries. The reasonably constant price of sugar during the year was helpful to the sugar industry and a majority of the plantations paid dividends. The larger producers in the pineapple industry improved their mainland marketing conditions considerably with consequent beneficial results in their economic position.

TRUST TERRITORY OF THE PACIFIC ISLANDS

In the Trust Territory of the Pacific Islands project has followed fast on project, and program on program, with the Administrative offices and the district centers sharing in the activity. In the present stage of island development progress in local government, in health and education, and in business life continues to depend more on the initiative of the Federal Government than will be true in the future.

During the fiscal year financial problems were satisfactorily resolved which have heretofore prevented the payment of compensation to Micronesians for land used by the United States during and after World War II. Such payments were begun in May 1956, with $39,918.24 paid on 229 separate claims in Truk District. Arrangements were completed in June 1956, for the transfer from the Department of the Navy to the Office of the High Commissioner of $1,245,000, originally appropriated by the United States Congress for settlement of these claims.

A United Nations visiting mission consisting of four members and accompanying secretariat made an exhaustive tour of the districts over a month's period beginning February 13, 1956. In June, the Acting High Commissioner served as special representative of the United States in reporting to the United Nations Trusteeship Council on the administration of the Trust Territory during the 1955 fiscal year.

Significant progress in local government during the year included actions of the Palau Congress in implementing the collection of taxes and fees, establishing a district budget, setting up minimum qualifications for elementary school teachers and providing financial assistance in aiding teachers to attain established standards. In Truk, for the first time, the annual Magistrates' Conference approved a district-wide budget. In Ponape, the first chartered town in Micronesia (Kolonia), came into being.

Improvements in Agriculture and Transportation and Communication

Since copra is the main export and agriculture the principal industry of the Trust Territory, a strengthening of the Department of Agriculture and Fisheries was a major administrative objective. A noted specialist was engaged on a 2-year contract to study methods of increasing the quality and quantity of copra produced, dried and marketed. A staff marine biologist was employed to carry out a similar project with respect to trochus, which is the second most important resource. New lands were made available during the year for homesteading, a program which is being accepted favorably in the territory.

Majuro in the Marshall Islands District has become established as a world port, with major ocean-going vessels calling for the collection of copra and delivery of trade goods. A Marshallese-owned company has taken over the Marshall Islands intradistrict shipping, with two ships in service as of June 30, 1956, and another expected to be in operation before August 1956. Local trading companies in other districts are making plans for assuming some of the intradistrict shipping duties which are currently provided under Government contract.

Major radio stations in the districts and at Guam were linked by high-powered transmitters, and new efficient antenna systems have replaced the old. All Trust Territory communications traffic is expected shortly to be routed through Truk where the Chief Communicator is stationed. Eighteen secondary stations have been installed outside district centers.

Work proceeded on needed public works facilities in the districts, including power plants, warehouses, reefers, roads, administration housing, and harbor and dock installations. Construction expenditures for the fiscal year ended June 30 amounted to $932,253.16.

Education and Public Health

A permanent site, selected in Ponape District for the Government-operated Pacific Islands Central School, has been surveyed and preliminary plans drawn. The addition of a third year of schooling at PICS will go into effect in September 1956, with 25 graduate students enrolled. Continued stress in the districts was placed on the development of study materials in the local languages and teacher training sessions were held throughout the territory. In cooperation with other departments, particularly health and sanitation, coordinated team visits were made to local municipalities.

A new hospital was completed in the Rota District, and additional hospital facilities were placed under construction at Koror (Palau District), Ponape, Truk, and Yap. The school of nursing was moved from Ponape to Palau District, and a permanent concrete structure erected. Grants from the China Medical Board of New York help support the work of the school. A model health center has been created at Ngerechelong, Babelthuap Island, Palau District.

Use of the newest sulfone (DDS) for leprosy has succeeded in almost eradicating the disease from the Trust Territory. The total number of cases now is only 30, as compared with more than 100, 5 years ago. All were transferred from the leprosarium at Tinian during the year and are now being treated in their home districts. Tuberculosis remains the biggest health problem, and educational health programs were directed toward preventive measures and early detection of existing cases.

Management Improvements

In the field of management, an inspection program and a property accountability system were instituted. The first annual capital inventory was submitted, as of April 30, 1956, to the Office of Territories. An electrical consultant surveyed the power needs of the districts to determine how these needs could be met at the lowest possible cost and a research consultant conducted a survey of the tax structure and potentialities of the territory. Safety measures were increased throughout the territory.

A development expected to improve the personnel situation was the transfer of the majority of American employees from appointed contract status to competitive civil service. Two Micronesians were elevated to top administrative positions, Dwight Heine as District Director of Education, and Arobati Hicking as District Director of Public Health, both in the Marshall Islands.

Budget and Expenditures

Obligations incurred during 1956 in the administration of the Trust Territory were as follows: High Commissioner's Office, $34,766.37; judiciary $44,310.15; construction, $932,918.12; operations and administration $5,933,258.52; total obligations, $6,945,253.16. Of the foregoing obligations, a total of $5,984,359.00 was actually expended, leaving $960,894.16 as unliquidated obligations at the end of the year. The 1957 budget is for $6,250,000.

GUAM

Progress and improvement characterized the activities of the Government of Guam during the fiscal year 1956.

More than $31 million worth of goods poured through Guam's commercial port during the year. The port was able to complete repayment of its original $100,000 operating capital into the Government's general fund.

During the year, cargo-handling rates were reduced and a large expansion of port facilities was undertaken with Navy cooperation. A stepped-up training program continued as work efficiency levels rose.

The Department of Agriculture continued its program of promoting more modern farming methods and there was an increased use of demonstration and experimental farms. Livestock breeds were further improved. Gratifying results in poultry-improvement programs had a marked effect in the reduction of the price of fresh eggs in the face of heavy local egg demand in both civilian and military markets.

The Department of Medical Services was able to report a sharp reduction in the death rate from tuberculosis, the island's most serious health problem. The inauguration of BCG tuberculosis vaccine programs throughout the Island was an important step in reducing TB on Guam to a minimum. Continued emphasis was placed on preventive medicine and public education through the Public Health Division.

Important additions were made to Guam's educational facilities During the year the $300,000 Santa Rita School was completed, and the Inarajan junior high school was under construction. Initial work was also started on the new Tumon junior-senior high school Academic standards are high, and the demand for teaching personne is being met. However, school facilities remain a serious problem for the Government of Guam.

The tax enforcement program continues under the Department of Finance. In fiscal 1956 the income tax audit section was successful in locating $127,000 in delinquent taxes due the Government of Guam. A promising training program to increase local accounting personnel was initiated.

Training activities also included a stepped-up program for public safety personnel. Guam has noted a sharp decrease in traffic accidents and traffic fatalities and vice and gambling are at negligible levels.

The Department of Land Management during the fiscal year, brought up to date a heavy backlog of land records, an important step in unsnarling Guam's land title problems. The third Guam Legislature passed an important zoning code for Agana.

In public works, the new Guam Memorial Hospital was in the final construction stage and the important Agat-Umatac road, which brings southern villages closer to Agana, was completed. Public utility facilities are continually being expanded to provide more service to more people, as additional funds become available.

AMERICAN SAMOA

A quickening in economic activity was the major feature of fiscal year 1956 in American Samoa. This was reflected in the increased number of letters of credit and loan applications in the Bank of American Samoa, and the fact that money turnover has been accelerating.

Encouraging advances have been made in the fishing industry which employs about 350 people per day. The canning and processing of fish constitutes the major new industry in American Samoa. Approximately $4,600,000 worth of fish and fish products were exported during fiscal year 1956.

Improvements in Air and Water Transportation

Improved air and surface transportation to Hawaii and the mainland also contributed to an improved economic situation. January 1956, for example, marked the beginning of the first regularly scheduled commercial airline service to American Samoa. Improvements were made in existing facilities to accommodate these flights and it is expected that during fiscal year 1957 the territory will be served by two regularly scheduled flights per month.

Plans for an international airport to accommodate large commercial aircraft have been developed and heavy equipment for construction is being assembled for transfer to the Government of American Samoa.

This territory, by reason of its facilities and location, will thus be able to provide the most modern commercial air facilities in the islands of the South Pacific.

During the year the Government terminated its operations in the interisland shipping business and transferred its activities to private enterprise. The leasing of the petroleum tank farm to a United States oil company was made possible by airport improvement and increased surface shipping. These developments resulted in replacing what previously had been essential governmental services.

Pago Pago Harbor was improved in fiscal year 1956 and the number of freighters putting into the harbor has increased greatly. In November 1956 the Matson Navigation Co. will institute a South Seas passenger service with two new luxury liners, scheduled to stop at Pago Pago once each 21 days.

Future Development Possibilities

Plans for future economic development will emphasize the tourist industry, and local cottage industries, chiefly handicraft and mat making. It is expected that about 10,000 persons will visit American Samoa each year, which will mean greater local cash income, particularly through the sale of handicraft items. The need for coordinating the various aspects of territorial development resulted in the establishment of a development and planning office for economic, social, and political matters.

Local Government, Education and Public Health

Much thought and work has gone into plans for a greater degree of self-government for the Samoan people. Work has continued on the draft of a constitution, which is nearly ready for consideration by a constitutional convention. Also, more responsibility is being placed on Samoan employees, and Samoans are being employed to replace stateside employees wherever possible. Added Samoan representation on boards and commissions has resulted in increased participation in policy decisions.

In public education, villages continue to improve and construct their own school facilities by means of group effort. A good permanent school building, made of locally fabricated concrete blocks, has become a mark of distinction and pride. Two villages completed new buildings of this type during the year and three others commenced work on them. With the assistance of the Barstow Foundation, a scholarship program was established to send four Samoan teachers annually to Hawaii or the mainland for further training.

In the field of medical services, the staff of physicians was increased to 5, 1 of whom is the first locally born Samoan to receive a medical degree. An educational program was instituted to provide occupational therapy for patients hospitalized for long periods of time. Three teachers provide school-type educational facilities for patients, mostly children, confined to cardiac and tubercular wards, and for patients in the leprosarium.

The total cost of operations during fiscal year 1956 was $1,579,042.94. Accrued revenues totaled $670,205.85 as compared to $591,317.00 in fiscal year 1955. Export values in fiscal year 1956 jumped to $4,933,988.40 from $1,270,548.10 in fiscal year 1955, largely due to the export of canned tuna.

THE VIRGIN ISLANDS

On August 15, 1955, the President of the United States announced the appointment of Walter A. Gordon, of California, as Governor of the Virgin Islands to succeed Governor Archie A. Alexander who submitted his resignation effective August 31, 1955. Governor Gordon took the oath of office in Washington on October 7, 1955, and assumed office in the Virgin Islands on October 16.

On January 26, 1956, the Governor convened a special session of the Legislature to consider the revision of an inadequate tax law, appropriations for 5 of the 9 departments of the Government as well as for the Legislature, and other measures. Fifteen of the items on the agenda were passed and approved, 1 was vetoed, and 2 were tabled by the Legislature.

During the first of the year contracts were let for the waterfront highway, St. Thomas, and for the construction of two schools in St. Croix, the consolidated elementary and high school in Frederiksted, and the elementary school at King's Hill. Approximately $100,000 was spent on repair and construction of highways and roads on St. Thomas, and $150,000 on St. Croix. For sewer expansion on St. Croix, $90,000 was allocated, and $40,000 on St. Thomas; $58,000 was allocated for the extension of the Telephone System on both islands; $125,000 was used to purchase heavy construction equipment to meet the demands required by the public works program.

Construction projects on the Island of St. John were held in abeyance pending approval of the proposed Virgin Islands National Park by the Government of the United States. However, the construction of new schools at Cruz Bay and Johns Folly, and the renovation of hose at Coral Bay were completed.

Many of these projects were begun under the Federal Virgin Island public works program, previously administered by the Office of Territories. The Revised Organic Act of the Virgin Islands (Act of July 22, 1954) transferred responsibility for this program to the territorial government. The transfer was completed during the fiscal year and plans for all projects, included in the Federal program, were turned over to the Virgin Islands Government which was thus enabled to get important work under way with a minimum of delay.

For the first time positive steps were taken by the Government to improve the fresh water supply in the Virgin Islands. A tug and a water barge, capable of carrying 266,000 gallons of fresh water, were purchased. Water has been successfully brought in from Roosevelt Roads, Puerto Rico and, unless there is a dire emergency, it will not be necessary again to request the Navy to bring water to the Virgin Islands.

A contract was made with an engineering firm to study the airport needs of the Virgin Islands in order that advantage might be taken of Federal participation in airport projects. The Legislature appropriated the sum of $200,000 this year to match Federal funds of $600,000.

In the Department of Health, the Division of Special Health Services was organized to promote and coordinate the public health services and medical care programs. A nurse-midwifery training program was instituted, the fifth annual mental workshop was conducted and fluoridation programs were put into operation. A major accomplishment was the installation of a full-time resident physician on St John.

A $15,000 fire on St. John, where there is no firefighting equipment indicated a need to correct this situation immediately. At Richmon Penitentiary a new program has been instituted whereby inmate are kept gainfully occupied in many fields. A recreational park ha been constructed by the prisoners within the penitentiary.

In September 1955, a veterinarian was employed in the Departmen of Agriculture and Labor. It was found that hog cholera existed i several sections, and a quarantine was placed in effect until th vaccination program in St. Thomas and St. John was completed.

The Department of Tourism and Trade performed such duties a were possible within the limits of the extremely low budget which wa appropriated by the Legislature. During the year 32 cruise ship visited St. Thomas and 60,000 folders were distributed to trave agents, airlines, and steamship lines. The Department of Educatio inaugurated a hotel training school to assist the hotels in securin qualified personnel.

The total amount of the revenues received during the year for th operation of the government, was $5,289,666.86. Of this amoun $2,553,993.85 were received from local taxes; $357, 781.20 were receive from fees and other revenues and taxes; and $2,377,891.78 were receive from (i) matching funds, and $2,045,332.98 from (ii) funds under the provisions of the Organic Act.

Virgin Islands Corporation

The Virgin Islands Corporation is responsible for aid in developing the economy of the Virgin Islands. Its principal operations cover the production and manufacture of sugar, provision for electric power, making of loans, and carrying on certain action programs which contribute to agricultural development and land and water conservation, such as the construction of dams, land clearance, reforestation, and livestock improvement. The agricultural programs are coordinated and carried out in cooperation with various agencies of the United States Department of Agriculture.

During 1956 VICORP produced 83,570 tons of sugarcane. The production per acre was 36.52 tons—the highest on record, and for the first time in its history the Corporation showed a profit, $53,696.86, in the production of sugarcane. The Corporation processed 135,258 tons of sugarcane and manufactured 12,885 tons of raw sugar. The factory operation has continuously shown substantial financial losses, and while some improvement was made, 1956 losses amounted to $357,091.70.

Power operations have improved steadily, both in efficiency of service and income, since the acquisition of the local power facilities by the Corporation. While consumer rates have been substantially reduced, 1956 net income amounted to $84,799.59. Power was extended to two small islands in St. Thomas harbor and a project to provide power to the Island of St. John was begun. Extensive reconstruction and building of new distribution lines were carried out on both islands.

A total of 18 earth dams were completed, 14 in St. Croix and 4 in St. Thomas and St. John, making a total of 84 dams constructed to date under this program, with a total estimated impounding capacity of over 400 million gallons of water. The results of the dam program have been so oustanding and effective in providing water and in raising the general water table with resulting increase in available well water, that its monetary value would be difficult to calculate.

The other agricultural programs, including land clearance, improved livestock production, and forestation, have also contributed to the overall development of the islands, particularly in St. Croix. Appropriations for these purposes and for the dam construction program amounted to $130,000, all of which was used during the fiscal year.

The Corporation has operated for the second year the properties located on St. Thomas, formerly utilized by the Navy and now assigned to the Secretary of the Interior under a use permit. These properties consist of the airport, housing facilities, dock facilities, beaches, and miscellaneous buildings leased as hotels and for industrial purposes. The income from these properties during 1956 amount to $152,113.

PUERTO RICO TRAINING PROGRAM FOR TECHNICAL ASSISTANCE

The Puerto Rico training program for which the Department of the Interior serves as the Washington office continued to expand during the fiscal year 1956. Nearly 1,000 foreign nationals from all over the world visited Puerto Rico for purposes of academic or inservice training, or to act as observers of various activities carried on by the Commonwealth government and private enterprise. The number of foreign nationals by area and sponsorship is shown below for the period July 1, 1955, to June 30, 1956.

Sponsor	Latin America	Near East, Africa, and South Asia	Far East	China and Indochina	Canada and Europe	Total
International Cooperation Administration	297	66	116	23	9	51
ICA-Caribbean DOTS	138	----------	----------	----------	----------	13
United Nations and specialized agencies	92	13	2	2	1	11
U. S. Department of State	55	----------	----------	----------	----------	5
Nongrant	53	1	2	2	1	[1] 5
Other foreign visitors	54	22	5	----------	9	9
Total	689	102	125	27	20	96

[1] Includes 20 grants made by Puerto Rico under the Commonwealth exchange program.

—United States visitors concerned with technical assistance (not in total), 60.

Office of the Administrative Assistant Secretary

D. Otis Beasley, *Administrative Assistant Secretary*

THE Administrative Assistant Secretary discharges the duties of the Secretary with respect to administrative management, including Administrative Services, Budget and Finance, Inspection, Management Research, Personnel Management, Property Management, and Security. Secretarial divisions bearing these titles are under his lirection and supervision.

A report for each staff division is included:

Division of Administrative Services

Floyd E. Dotson, *Director*

HE Division of Administrative Services maintained its full proram of services to the Department plus supplying the housekeeping nd operating services to the Office of the Secretary, other departnental offices, and the Commission of Fine Arts. Despite a heavy ncrease in load levels all work is on a current basis.

Branch of Library Services.—Statistics for the Central Library how—31,469 reading room patrons; 18,464 telephone calls; 94,293 ems circulated; 6,557 inter-library loans; 16,317 reference queries;),512 books and periodicals received. Total holdings rose to 448,257 olumes.

Fiscal Section.—Normal budgetary and accounting services were rovided for all units of the Office of the Secretary, other departmental offices and the Commission of Fine Arts. Expenditures for the year totaled approximately $7 million and operations financed from the working capital fund came to slightly more than $1,200,000. The Section also handled the control budgeting and reporting work on approximately $3 million transferred from other Federal agencies for work performed in their behalf by the various bureaus and offices of the Department.

Records Management.—Approximately 400 cubic feet of obsolete records were destroyed and 150 feet of low-activity records were transferred to storage space. One hundred and five file cases were released to other agencies.

Personnel Operations.—An employee handbook was developed for distribution to all new employees to assist in their orientation toward the Department's programs and activities. Under authority of Public Law 763, several categories of positions were transferred from Classified to Wage Board status and a wage board was established to fix their wages. The usual personnel services were supplied to all units of the Office of the Secretary, other Departmental offices, and the Commission of Fine Arts.

Museum.—Visitors to the Museum totaled more than 50,000 for the year, and more than 10,000 people attended the periodic showings of educational and historical films. Twenty-two regular exhibits were updated and seven special exhibits on current Department programs were put on display.

Central Services.—Statistics for the year show 20,000 duplicating jobs, 3,300 telephone changes, 14,000 photographic jobs, 2,500 printing and binding requisitions, 7,000 requisitions for stock supply items, 2,800 procurement actions, and 6,000 dispensary treatments.

Division of Budget and Finance

Sidney D. Larson, *Director*

THE Division of Budget and Finance is responsible for staff supervision of the budget and financial activities of the Department. It represents the Department in these fields working in liaison with the Bureau of the Budget, other Federal agencies, and appropriation committees of the Congress.

Appropriations made to the Department by the Congress for the fiscal year ending June 30, 1956, totaled approximately $455 million.

of which $204 million was appropriated to the water and power bureaus and $251 million to the other bureaus of the Department.

The Division continued its program of improving the budget justifications submitted to the Congress in order to make them concise, easily understood, yet fully reflect the need for the funds requested. Forms and procedures used to present summary budget information to the Secretary and Assistant Secretaries were simplified. Thus, these officials were provided with an effective basis for deciding policy on the type and magnitude of departmental budget programs. In accordance with the Hoover Commission recommendations on Budget and Accounting, reviews of the Department's budget structure were initiated. Determinations of those areas where changes in the activity breakdown would be desirable were being made in order to more nearly align the budget structure with the organizational pattern of the bureaus.

The Division participated in the joint programs of the Bureau of the Budget, Treasury Department, and General Accounting Office for improving accounting and fiscal reporting. An accounting survey was instituted in the Bureau of Mines to determine the need for modifying the present accounting system due to a change in procedures for authorizing work projects. Assistance was given to the National Park Service in the installation of a modern accounting system in the various fiscal offices of the Service. Continued assistance was provided other bureaus of the Department in accounting systems improvements and other fiscal matters.

The Division continued to cooperate with the General Accounting Office and with the bureaus of the Department in the comprehensive audit program and provided the leadership for correcting deficiencies in fiscal and other matters set forth in the audit reports.

Division of Inspection

W. Darlington Denit, *Director*

THE Division of Inspection is responsible for the inspection and special investigative activities of the Department. A formalized program of inspection was initiated in the fiscal year 1955, and substantial progress in program development has occurred during the past fiscal year. Major responsibility for actual inspection performance is placed in the bureaus of the Department. The bureaus report that many inspection assignments were completed during 1956 and greater diversity in inspection work is being developed.

The major underlying purpose of the Department's inspection program is to preserve and foster high standards of moral and ethical conduct in the management of the Department's affairs. The increasing momentum of the inspection effort is providing information which enables the anticipation of regulatory needs and the application of corrective measures.

The investigative phase of the activities of this Division has been sponsored by the Department for many years. This activity extends, in the main, to special investigations of alleged administrative irregularities in the discharge of official duties. Special investigations of other matters within the responsibility of the Department are conducted as authorized by the Administrative Assistant Secretary. Only limited investigative authority has been delegated to the bureaus. During fiscal year 1956 a general improvement in the investigative program was made possible by organizational and personnel changes. An accumulated backlog of investigative cases on which no final decision had been made was removed and the rate of performance in field investigations was sharply increased. These factors have contributed to a total result which finds the investigative case load being handled on a current basis in all respects.

The Government employment policy of nondiscrimination, as provided in Executive Order 10590 and related Department regulations is being applied on a departmentwide basis. Specific complaints of discrimination have been at a minimum and periodic checks have revealed conscientious policy compliance in all bureaus.

Division of Management Research

Arthur B. Jevens, *Director*

THE Department's objective of expanding program performance with a minimum of increases in appropriations and personnel has given impetus to the development of more efficient and effective administrative processes. The Division of Management Research provides facilities for initiating, defining, and coordinating efforts throughout the Department towards accomplishing this objective.

The continuing development of the Departmental Manual, established last year to provide a single medium for the issuance of secretarial instructions, remains a major work assignment of the Division. Organization statements for all of the bureaus and offices have been published in the Organization Series of the Manual and are maintained current as changes in organization receive Secretarial approval. Policies and procedures in the field of departmental administration have also been issued and include instructions on a number of aspects of personnel management, finance, management improvement, administrative services and records and other property management. In the Program Series of the Manual, departmentwide instructions on watershed protection, the leasing of Federal farmlands, and fire protection and assistance have been published.

The Division conducted specific studies assisted by other Secretarial Divisions on the specialized problems relating to the functions of land appraisal and Indian education.

The Land Appraisal Study identified problem areas; outlined basic objectives, functions and programs; and recommended resolution of the management problems revealed.

The Indian Education Survey examined the management aspects of the education function of the Bureau of Indian Affairs including the evaluation of the administrative, financial, and staffing requirements of the program. Members of the survey team compiled basic source material, conducted field studies and prepared a written report on the organizational effectiveness of the existing program, and made recommendations for improvement of the general management pattern.

The management bulletin Management Highlights inaugurated last year by this Division has become an important medium for disseminating significant administrative management information to supervisors throughout the Department. It is published bimonthly and carries articles by members of the Division and others in the Office of the Secretary on their various management specialties, as well as reviews and summaries of articles on management in general. Increased demand for copies of Management Highlights has resulted in broader distribution. It is estimated that at least 8,000 supervisors read each issue.

The following reflects a cross section of the Division's other projects and outlines the scope of assistance rendered to the bureaus:

1. Coordination of the preparation of special reports and replies to the House Civil Service Committee's Subcommittee on Manpower Utilization and Federal Personnel Management;
2. Development of recommendations concerning the feasibility of establishing a centralized administrative service for the Department's activities in Alaska;
3. Initiation and participation in preliminary studies on the application of electronic computers and arranged for a Seminar on this subject;

4. Cooperation with the Cabinet Secretariat in the establishment of an effective committee management program;

5. Development and preparation of a Civil Defense Emergency Operation Handbook for use by the Department in connection with the relocation and emergency planning;

6. Assisted the Bureau of Land Management and Geological Survey work toward the development of a memorandum of agreement on mineral leasing procedures;

7. Assisted the Bureau of Indian Affairs in the reorganization of the Commissioner's Office; and

8. Coordination of the reports on the Commission on Organization of the Executive Branch of the Government.

The annual scheduling of management improvement program projects has been reviewed and the instructions revised. It is now clearly limited to major items for which scheduling is appropriate and useful. The former method included many day-to-day improvements which added considerably to the reporting burden.

There has been an increase in the Incentive Awards Program activities. This effort is directed toward the recognition of employees and supervisors on suggestions and improvements in the manner of carrying out the Government's business and rewarding individuals and groups for outstanding performance and meritorious distinguished service. During the past year there has been an 81.5 percent increase in the number of suggestions received and an estimated savings totaling over $7,600,000.

		Dollar savings
Number of suggestions received	2,897	$766, 628
Superior performance awards	556	5, 167, 285
Special act awards	25	1, 651, 400
Honor awards granted:		
Distinguished	43	
Meritorious	111	
Commendable	263	

Division of Personnel Management

Newell B. Terry, *Director*

DURING this year the activities of the Division of Personnel Management were geared to increasing demands in the field for personnel administration and to a highly competitive labor market in the critical occupations. At the end of the fiscal year the Department had 54,143 employees on its rolls. To carry out its programs large numbers of professional, subprofessional, and supporting personnel are required. Recruitment in these fields has been difficult. The Division conducted 2,700 interviews with applicants for all types of positions, and answered 2,200 letters of inquiry about employment.

A Branch of Safety Engineering was established within the Division in September 1955, dedicated to the prevention of accident losses in cooperation with bureau and office safety programs. A program has been formed to reduce accidents which provides for continuing executive direction, definite assignment of responsibilities, effective engineering controls, adequate safety training, employee cooperation, and accident records to show causes, trends, and costs.

The Division worked in cooperation with the Civil Service Commission in bringing about within the Department broad programs to enhance recruitment possibilities. Among these were the extension of the civil service to Alaska, Guam, and the Trust Territory of the Pacific Islands; increasing the minimum pay rates for engineers; and administering the Federal Service Entrance Examination.

A comprehensive review was made of all training activities in the Department resulting in a strengthened and reissued training policy. Twenty-nine bureau trainees successfully completed the seventh Departmental management-training program which covered a 7-month period. The training program was handicapped by a lack of adequate authority to provide training in non-Federal facilities.

Pursuant to Public Law 763 approximately 2,300 Classification Act employees were changed to wage board schedules. Conferences with Alaska Railroad employee representatives resulted in a study of prevailing wage rates and employment conditions in the Anchorage-Fairbanks area of Alaska. A uniform pay schedule was established for seasonal employees in Alaska to be effective January 1, 1957. Classification and wage administration training conferences held in Denver, Portland, and Washington were attended by 208 conferees from all bureaus of the Department.

Fifty Civil Service regional inspection reports provided a means of reviewing personnel management throughout the Department. In addition, special studies were made and numerous reports prepared concerning many phases of personnel administration. Some were prepared as a basis for program development, others to meet requests for information from the Congress, the Bureau of the Budget, and the Civil Service Commission. The Division is especially pleased that one audit report disclosed the fact that the Department of the Interior had the lowest record of sick leave used of any agency participating in the study.

A complete revision of the departmental personnel instructions was instituted. This includes chapter issuances as part of the Departmental Manual, a personnel management letter series for issuin temporary instructions and information, and a general informatio bulletin series to convey information about functions and programs

The Division participated in mobilization planning including th establishment of an Interior executive reserve unit.

Division of Property Management

N. O. Wood, Jr., *Director*

DURING the fiscal year 1956 the Division of Property Managemen developed criteria for determining the real property needs of th several bureaus, and directed the disposition of a number of majo property holdings which proved to be excess to the Department' program requirements. In the field of contracting and procurement the Division developed guideline regulations for administration of th "Buy American" act to carry out the purposes of Executive Order No 10582, and issued detailed procedures for the Department giving ful effect to the small business preference provision of section 214 of th Small Business Act of 1953, as amended. Additional emphasis wa also placed on the observance of the nondiscrimination provision o Federal contracts, in cooperation with the President's Committee o Government Contracts. Educational material explaining this program was given widespread distribution.

As implementation of a Hoover Commission recommendation o paper work management, a directive was issued requiring each of th bureaus to establish and maintain a forms management program guidelines were outlined to assist the bureaus to meet the departmenta standards. Disposition of inactive and obsolete records continue satisfactorily. At the end of the year there were more than 80,00 cubic feet of inactive records of the Department being stored an serviced by Federal record centers.

Field inspections of the real and personal property operations inventory practices, and records management procedures undertake during 1956 and recognition was given to field auditor's reports submitted by the General Accounting Office with corrective action take where appropriate.

During the year 306 radio frequency assignments were issued t provide for the radio-communication requirements of the variou offices and bureaus of the Department. Individual frequency assign ments registered with the International Telecommunications Union totaled 323. Procedures were developed for the processing of frequency assignments for broadcasting stations under the control of the Department. Procedures were also developed for issuing certificates to operating personnel of Interior ship and aircraft radio equipment. Assistance was given the Office of Defense Mobilization in the development of mobilization plans for the use of radio frequencies in wartime emergency.

The staff of the Division continued its participation on a number of interdepartmental boards and committees established to improve administrative regulations and establish technical standards on a governmentwide basis.

Division of Security

J. Cordell Moore, *Director*

THE activities of the Division of Security during the fiscal year ending June 30, 1956, have placed specific emphasis upon physical security and civil defense. The physical security area has been extensively studied; recommendations were made and implemented with effective results.

The Division of Security continued planning development in the civil defense area of its responsibilities. The disaster relief program under Public Law 875, 81st Congress, continues to improve as more experience is gained by the field organizations. The Regional Defense Liaison Officers organization has been modified, utilizing, where possible, the field committee chairman as Departmental Defense Liaison Officers (DDLO's). In each civil defense region, the DDLO's have made considerable progress in developing inventories of technical personnel, material and equipment which would be useful in disasters of all types. The Department's participation in disaster assistance during the past year indicates a very satisfactory degree of liaison with FCDA at local, State and National levels. It is also apparent that the Department's planning has had concrete results in aiding various disaster areas.

The Division of Security, in cooperation with others of the Department, contributed to the development of relocation and continuity of Government planning. The Department's operations in this area have progressed effectively.

OFFICE OF THE SOLICITOR

J. Reuel Armstrong, *Solicitor*

THE fiscal year ending June 30, 1956, was a productive one in many respects. This fiscal year was the first full year during which the field offices operated as components of the integrated Office of the Solicitor. The results have been gratifying. The new system has been found to be satisfactory by administrative personnel of bureaus which formerly had their own attorneys in the field. Other administrators are taking advantage of what is to them a new opportunity to obtain legal services in the field. An illustration of this trend was the increasing use of the services of the attorneys in the Portland region by the Fish and Wildlife Service, which in the past has had no attorneys in the field. There was evidence too, during the fiscal year, that the bureaus had begun to follow the advice of this Office to consult the lawyer "on the spot" without respect to his prior "bureau affiliation". Thus, for example, the State supervisor of the Bureau of Land Management turned to the field solicitor at Santa Fe for legal advice and excellent working arrangements have been established between the office of the regional solicitor at Tulsa and the office of the Geological Survey in connection with the administration of oil properties and interests of the Indians.

As was anticipated, the integration of the field offices has in a number of instances divorced lawyers from administrative tasks which were not properly theirs and has made possible a flexibility respecting the assignment of work which serves the interests both of economy and efficiency. For example, mention was made in the report for the fiscal year 1955 of the transfer to the Denver region of the leasing of mineral lands acquired by the Department of Agriculture in connection with land utilization projects. Although the full impact of this work has not yet been felt, the Billings field office, without increase in personnel, examined in excess of 2,000 titles during the fiscal year.

There was no diminution in the heavy volume of legal work throughout the Office. More than 131,000 matters were disposed of during the year. On the whole, the work was kept reasonably current and there were fewer matters undisposed of at the close of the fiscal year than were pending at the beginning. On an average throughout the year there were 173 attorneys in the Office. Substantial progress was made by the examiners of inheritance in the field in disposing of Indian probate cases. Of 3,121 cases pending at the beginning of the year, 1,921 were decided. Some 2,127 new cases were reported, of which 815 were decided. At the end of the year there were 2,512 cases awaiting action. The per capita distribution of tribal funds to the Menominee Indians of Wisconsin and the Kaw Indians of Oklahoma placed an additional burden on certain of the examiners of inheritance. Arrangements were made to accelerate the preparation and prosecution of applications for patents on inventions made by employees. The progress in this field should serve as an incentive to invention within the Department.

A further reduction was made in the number of pending appeals in land cases. Some 184 such appeals were decided during the fiscal year. Seventy appeals were pending at the close of the year as compared with 98 at the beginning. The Board of Contract Appeals took final action on 33 appeals during the year. Of the many appeals in various categories of Indian matters decided during the year, the greatest number involved the preparation of final membership rolls of various tribes under legislation terminating Federal control and supervision. Some 298 such enrollment appeals were decided. Some 237 tort and irrigation claims were disposed of in the headquarters' office and by the regional and field solicitors and final action was taken on 12 appeals from determinations by field attorneys.

The heavy volume of requests for reports on legislative proposals continued from the Congress. During the 84th Congress, 1,373 requests were received as compared to 1,137 for the 83d and 1,158 for the 82d Congresses. Despite the greater number of requests made by the 84th Congress, the Department was able to respond to more than was the case, comparatively, in the preceding two Congresses. The record of enactment of proposals that were on the President's legislative program was one of considerable success. In the second session of the 84th Congress, the Colorado River Storage Project Act (Public Law 485) was enacted, as was the Washita River Basin Act (Public Law 419) providing for the development of water resources, respectively, of the Upper Colorado and the Washita River basins. The bill for the Fryingpan-Arkansas project, Colorado, failed of enactment by a narrow margin. The act of July 4, 1955, relating to the construction of irrigation distribution systems was amended (Public Law

520) to incorporate the changes recommended by the President at the time he signed the original act. The bill to admit Hawaii did not pass, but the Congress did enact the Alaska Mental Health Enabling Act (Public Law 830). Other important enactments were the establishment of the Virgin Islands National Park (Public Law 925), the Fish and Wildlife Act of 1956 reorganizing the Department's administrative machinery for the management of fish and wildlife functions (Public Law 1024). Several acts were passed either terminating or looking to the termination of Federal control over Indian tribes (Public Law 921, Peoria; Public Law 943, Ottawa; Public Law 887, Wyandotte). It is interesting to note that out of 640 bills passed in the second session of the 84th Congress, approximately 190 were of direct interest to the Department of the Interior.

The Federal Range Code, the Alaska grazing regulations, and the rules of practice in land cases were completely revised during the year. The Office participated in the work of the "Interdepartmental Committee for the Study of Jurisdiction Over Federal Areas Within the States" throughout the year. In April the committee completed its study of the practical aspects of legislative jurisdiction over Federal areas within the several States and made several recommendations, which were approved by the President. As an aid to the Department's work a Guide to Federal Tort Law and a Guide to Government Contract Law were prepared during the year. These guides consist of digests of selected judicial and administrative decisions and legal and technical bibliographies.

There follows a selected list of important cases decided by or pending in the courts during the fiscal year, of important administrative decisions, and of significant opinions of this Office. A discussion of cases of especial importance to the Bureau of Reclamation appears in the report of the Commissioner of Reclamation for the fiscal year.

United States v. *Louisiana*, Original No. 15 (U. S. Sup. Ct.).—This suit seeks to determine the respective areas of jurisdiction of the United States and the State of Louisiana on the outer Continental Shelf off the Gulf of Mexico. Opposition of the State during the year to a proposed sale by the United States resulted in a prohibition by the Court of further leasing or the drilling of wells in the disputed areas except by agreement of the parties filed in the Court.

Arizona v. *California*, Original No. 10 (U. S. Sup. Ct.).—This case (which is also noted in the annual report of the Commissioner of Reclamation) involves, among other things, claims to rights in waters of the Colorado River by large numbers of Indian tribes and individual Indians.

Squire v. *Capoeman* (351 U. S. 1).—Direct income from lands allotted to Indians under the General Allotment Act of 1887 is not subject to Federal income taxes.

Yakutat Development Company (63 I. D. 97).—Irrevocable powers of attorney and agrements executed by oil and gas offerors which gave a single agent extensive powers of control over the offers and any leases to be issued and a substantial beneficial interest in proceeds to be obtained under the leases served to make the agent chargeable with the acreage in the lease offers.

M. A. Machris, *Melvin A. Brown* (63 I. D. 161).—Where an oil and gas lease was relinquished before the end of its primary term but the relinquishment was not noted on the tract books until after the end of the primary term, the land in the lease did not become available for further filing at the end of the 5-year term but only after the relinquishment was noted on the tract books.

Thomas F. McKenna et al. (62 I. D. 376).—The Secretary has no authority to reinstate a relinquished oil and gas lease.

Howard M. Wilson, *The Navajo Tribe* (63 I. D. 36).—The owner of a fee simple estate in land under a deed reserving the minerals to his grantor is entitled to assert a preference right to purchase contiguous public land offered at public sale and an Indian tribe holding the beneficial interest in land purchased in trust for the tribe by the United States is entitled to assert such a preference right.

Walter H. Bullwinkle, *Joseph E. Vogler* (63 I. D. 172).—Clarifies the cultivation requirements under the homestead law for an entryman entitled to credit for military service.

The Pelton Water Wheel Company et al. (62 I. D. 385).—The insolvency of a subcontractor or supplier is not an unforeseeable and excusable cause of delay entitling a contractor to the benefits of an escalator clause.

Jeneckes' (62 I. D. 449).—An appeal opens up the entire record and the Board of Contracts Appeals may disallow a claim allowed by the contracting officer.

Sam Bergesen (62 I. D. 295).—Where a contractor voluntarily accepts and signs a change order or similar form of contract modification, he cannot, in the absence of fraud or duress, successfully assert a claim for additional costs alleged to have resulted from changes ordered.

Electric Engineering and Construction Service, Inc. (63 I. D. 75).—A claim based on an alleged unreasonable delay by the Government in furnishing material is in the nature of a claim for unliquidated damages and is not allowable under a provision of the specifications permitting reimbursement for expenses incurred because of suspension of work, when a suspension order was not issued by the contracting officer.

R. P. Shea Company (62 I. D. 456).—A claim for additional compensation because of large overruns in estimated quantities is a claim for breach of an implied condition of reasonability in the clause of the specifications relating to approximate quantities and constitutes a claim for unliquidated damages which cannot be allowed.

Roxie Thorson et al. (63 I. D. 12).—The reduction or dilution by activities of the Bureau of Reclamation of the mineral content of Soap Lake, Wash., is not a foundation for a valid irrigation claim against the Government.

Kathryn L. Rogers (63 I. D. 150).—The rights and duties of private persons within Yellowstone National Park, a place over which the United States has acquired exclusive jurisdiction, are governed solely by Federal law.

M–36350 (63 I. D. 188).—The Secretary of the Interior has no authority to call a special election for the election of councilmen by an Indian tribe incorporated under section 16 of the Indian Reorganization Act, if such authority is not conferred upon him either by the tribal constitution or by statute.

M–36310.—Tribal royalties from Government leases for the development of oil and gas resources on the Fort Peck Reservation, Mont., are subject to the privilege and license tax authorized by the State under an act of Congress.

Memo, Reg. Sol., LA.—The failure to submit a bid form prior to bid openings is an informality which may be waived when in the interest of the Government where the intention to submit a bid is otherwise sufficiently evidenced by the submission of a properly executed bid bond together with a signed Standard Form 23 (construction contract) which specifies the amount bid and refers to the contract specifications by number.

M–36294.—The act of May 11, 1938, as amended, did not contemplate that title to fishery facilities on the Columbia River constructed on State-owned lands would pass to the States.

M–36322.—Payment of royalties is required with respect to gas produced from certain leases maintained pursuant to section 6 of the Outer Continental Shelf Lands Act on which sulfur mining operations are conducted where the gas is used for fuel in the sulfur mining operations.

M–36330.—The act of June 4, 1954, amending the act of June 14, 1926, providing for the disposition of lands for recreational purposes, did not terminate the provisions for the reversion of title and land-use contained in patents issued under the act of 1926.

M–36295.—Sand and gravel and other low-grade rock materials which are useable only for "filling" purposes and "blow" sand and other materials used principally for agricultural and horticultural purposes are not subject to entry and patent under the mining laws.

M–36351.—Where lands applied for in a State school indemnity selection are classified as improper for such selection, the application is subject to rejection, but it may not be rejected on the sole ground that the base lands which had vested in the State prior to the inclusion of the land within the exterior boundaries of a reservation are less valuable than the selected land.

M–36222.—The Department is without authority to obtain excess equipment, material, and supplies without reimbursement for the governments of Alaska, Hawaii, Puerto Rico, the Virgin Islands, and Guam but it may obtain such property for the governments of American Samoa and the Trust Territory of the Pacific Islands.

TECHNICAL REVIEW STAFF

Roy W. Morse, *Director*

DURING fiscal year 1956, the Technical Review Staff provided staff services for the Presidential Advisory Committee on Water Resources Policy, of which the Secretary of the Interior was Chairman. Other members were the Secretaries of Agriculture and Defense, with the Departments of Commerce, Justice, and Health, Education, and Welfare and the Bureau of the Budget cooperating in the development of the report. On December 22, 1955, the report was submitted to the President and on January 17, 1956, the President transmitted it to the Congress.

The TRS is responsible for coordinating activities of the bureaus under the Watershed Protection and Flood Prevention Act of August 4, 1954. A Watershed Manual on procedures and policies was issued by the Department on November 3, 1955. As of June 30, 1956, departmental comments on 30 work plans had been submitted to the Department of Agriculture for transmittal to the Congress.

The TRS provides departmental representation on an Antarctic Working Group which recommends operating policy for, and monitors, the United States antarctic program. The principal antarctic matters affecting Interior have to do with the preparation of maps and with geological and biological investigations.

The TRS has continued to coordinate certain aspects of the Department's defense mobilization activities and to do staff work in connection with the secretariat's participation in meetings of the Defense Mobilization Board. Pursuant to arrangements requested by the Office of Minerals Mobilization, a member of TRS serves as operational liaison between the OMM and the Bureau of Mines and Geological Survey in connection with the Department's defense responsibilities in the field of minerals and as staff liaison between the Office of Minerals Mobilization and the ODM on problems of mineral supply. Thus, the TRS has participated in the review of 14 briefing reports and in the preparation of 22 reports concerning the supply-requirements situation of individual minerals as requested by the Office of Defense Mobilization. The TRS also provides the departmental representative on the Industry Evaluation Board. From July 1, 1955, through June 30, 1956, 50 analyses—of which several pertained to mineral production facilities—were prepared, reviewed and approved by the IEB, plus a 158-page analysis of telecommunications.

A staff member of TRS is chairman of a group, composed of representatives from the ODM, Departments of Defense and Commerce, and the Federal Power Commission, making a study to evaluate the power situation in the Niagara area in the event of an enemy attack.

The National Rural Fire Defense Committee, on which the TRS furnishes the principal representative for the Department, completed during the year "Guidelines for the Development of Rural Fire Defense Plans and Operations Designed to Cope With Enemy Fire Attacks in Rural Areas of the United States." At the close of the year, plans to accomplish this objective were being prepared throughout the entire United States.

The TRS provided departmental representation on the United States delegation in tariff negotiations held in Geneva, Switzerland, from January to May 1956, under the General Agreement on Tariffs and Trade. The United States completed negotiations with 21 other governments involving trade of about $1 billion, and included concessions given and received on various minerals and fuels and fish and fish products.

The TRS has the staff responsibility for the appraisal of public domain administered by the Department as requested by the House Committee on Government Operations; also for the appraisal of public domain minerals in the continental United States, Alaska, and the Continental Shelf, for areas administered by all Federal agencies. The TRS has prepared appraisal procedures and has acted in a consultant capacity with bureaus and agencies engaged in the actual appraisal work.

The TRS continued to carry the responsibility for the coordination of forest protection programs in the Office of the Secretary. Fire control was signally successful during the year with only 360,803 acres of land burned over, as contrasted to the 10-year average annual loss of over 1 million acres. Approximately 1½ million ribes bushes were destroyed in the program to protect the white pine forests from blister rust. Prompt and effective action was taken against many forest insect infestations.

Staff work as it relates to the coordination of timber management of commercial forest lands either federally owned or in trust, under review by congressional committees, was provided by the TRS. This review has as its primary objectives that of improving timber sale practices, modernizing timber sale procedures, and increasing the availability of Federal stumpage for sale.

Continuing operations of the TRS include the provision of Departmental liaison with the field committees, with the Bureau of the Budget on coordination of statistical standards, with the National Science Foundation, and with other Federal agencies on program matters of mutual concern. A number of special problems were also referred to the TRS during the fiscal year.

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